

PB84-196211

EPA (Environmental Protection Agency)
Method Study 14, Method 604-Phenols

IT Envirosience, Inc., Knoxville, TN

Prepared for

Environmental Monitoring and Support Lab.
Cincinnati, OH

May 84

U.S. Department of Commerce
National Technical Information Service

NTIS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

EPA-600/4-84-044
May 1984

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

EPA METHOD STUDY 14

METHOD 604-PHENOLS

by

Jack R. Hall, J. Richard Florance, Dennis L. Strother, and
Marlene N. Wass

IT Enviroscience
Knoxville, Tennessee 37923

Contract No. 68-03-2625

Project Officers

Edward L. Berg and Robert L. Graves
Quality Assurance Branch
Environmental Monitoring and Support Laboratory
Cincinnati, Ohio 45268

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

BEGIN
LAST LINE
OF TEXT

3/8"

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

EPA Form 3350-4 (4-80)

(PREVIOUSLY CIN. EPA FORM 357)

PAGE NUMBER

U.S. GOVERNMENT PRINTING OFFICE: 1981-500028

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TYPING GUIDE SHEET

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA-600/4-84-044	2.	3. RECIPIENT'S ACCESSION NO. PB84 196211
4. TITLE AND SUBTITLE EPA METHOD STUDY 14, METHOD 604--PHENOLS		5. REPORT DATE May 1984
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Jack R. Hall, J. R. Florance, Dennis L. Strother, and Marlene N. Wass		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS IT Enviroscience 312 Directors Drive Knoxville, Tennessee 37923		10. PROGRAM ELEMENT NO. BEB/C
		11. CONTRACT/GRANT NO. Contract No. 68-03-2625
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Monitoring and Support Laboratory Cincinnati, Ohio Office of Research and Development, USEPA Cincinnati, Ohio 45268		13. TYPE OF REPORT AND PERIOD COVERED R&D, 9/18/78 to 3/30/84
		14. SPONSORING AGENCY CODE EPA/600/06
15. SUPPLEMENTARY NOTES		
16. ABSTRACT An interlaboratory study in which 20 laboratories participated was conducted to provide precision and accuracy statements for the proposed EPA Method 604-Phenols for measuring concentrations of the Category 8 chemicals phenol, 2,4-dimethylphenol, 2-chlorophenol, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, 2-nitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, and 2,4-dinitrophenol in municipal and industrial aqueous discharges. The method provides for the determination of the phenols by gas chromatography (GC) with flame ionization detection (FID) or derivatization and detection by electron capture (EC). The study design was based on Youden's plan for collaborative tests of analytical methods. Three Youden pair samples of the test compounds were spiked into six types of test waters and then analyzed. The test waters were distilled water, nondechlorinated tap water, a surface water, and three different industrial wastewater effluents. A limited study was also conducted by applying the method for the analysis of the phenolics in dechlorinated tap water. The resulting data were statistically analyzed using the computer program "Interlaboratory Method Validation Study" (IMVS). Using the mean recovery for each of the subject compounds when analyzed by the GC-FID procedure, the method recoveries were in the range of 40 to 89%. Overall precision was in the range of 20 to 45% and single-analyst precision was in the range of 15 to 37%. Using the mean recovery for each of the subject compounds, when analyzed by the GC-EC procedure, the method recoveries were in the range of 32 to 76%. Overall precision was in the range of 38 to 64% and single-analyst precision was in the range of 29 to 48%. In general mean recoveries, overall standard deviations (S), and the single-analyst standard deviations (SR) were directly proportional to the true concentration levels. With the exception of the FID analysis of 2,4-dinitrophenol in three of the wastewaters, there were no discernible differences due to water types among mean recoveries, overall precisions, and single-analyst precisions.		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
18. DISTRIBUTION STATEMENT Release Unlimited	19. SECURITY CLASS (This Report) 20. SECURITY CLASS (This page)	21. NO. OF PAGES 271 22. PRICE

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

DISCLAIMER

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Contract No. 68-03-2625 to IT Enviroscience. It has been subject to the Agency's peer and administrative review, and it has been approved for publication as an EPA document.

6-1/2"

9-1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

11

PAGE NUMBER

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

EPA Form 2350-4 (4-80)

(PREVIOUSLY GIN, EPA FORM 237)

U.S. GOVERNMENT PRINTING OFFICE: 1981-000-000

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD
BEGIN
SECTIONS
HERE

FOREWORD

Environmental measurements are required to determine the quality of ambient waters and the character of waste effluents. The Environmental Monitoring and Support Laboratory (EMSL) - Cincinnati conducts research to:

- Develop and evaluate techniques to measure the presence and concentration of physical, chemical, and radiological pollutants in water, wastewater, bottom sediments, and solid waste.
- Investigate methods for the concentration, recovery, and identification of viruses, bacteria, and other microorganisms in water.
- Conduct studies to determine the responses of aquatic organisms to water quality.
- Conduct an agency-wide quality assurance program to assure standardization and quality control of systems for monitoring water and wastewater.

EPA Method Study 14, Method 604 - Phenols reports the results of EPA's method study for the following priority pollutants:

phenol
2-chlorophenol
2,4,6-trichlorophenol
4-chloro-3-methylphenol
4-nitrophenol
4,6-dinitro-2-methylphenol

2,4-dimethylphenol
2,4-dichlorophenol
pentachlorophenol
2-nitrophenol
2,4-dinitrophenol

Federal agencies, states, municipalities, universities, private laboratories, and industry should find this evaluative study of assistance in monitoring and controlling pollution in the environment.

Robert L. Booth
Director
EMSL-Cincinnati

BEGIN
LAST LINE
OF TEXT

3/8"

111

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

ABSTRACT

An interlaboratory study was conducted in which 20 laboratories participated to provide precision and accuracy statements for the proposed EPA Method 604-Phenols for measuring concentrations of the Category 8 chemicals phenol, 2,4-dimethylphenol, 2-chlorophenol, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, 2-nitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, and 2,4-dinitrophenol in municipal and industrial aqueous discharges.

The method includes extraction and concentration followed by the determination of the phenols using gas chromatography (GC) with flame ionization detection (FID). The concentrated extract may be more specifically analyzed for phenols by derivatization with pentafluorobenzyl bromide, column chromatography cleanup, and final measurement by GC with an electron capture (EC) detector.

The study design was based on Youden's plan for collaborative tests of analytical methods. Three Youden pair samples of the test compounds were spiked into six types of test waters and then analyzed. The test waters were distilled water, nondechlorinated tap water, a surface water, and three different industrial wastewater effluents. A limited study was also conducted by applying the method for the analysis of the phenolics in dechlorinated tap water. The resulting data were statistically analyzed using the computer program "Interlaboratory Method Validation Study" (IMVS). Using the mean recovery for each of the subject compounds when analyzed by the GC-FID procedure, the method recoveries were in the range of 40 to 89%. Overall precision was in the range of 20 to 45% and single-analyst precision was in the range of 15 to 37%. Using the mean recovery for each of the subject compounds, when analyzed by the GC-EC procedure, the method recoveries were in the range of 32 to 76%. Overall precision was in the range of 38 to 64% and single-analyst precision was in the range of 29 to 48%. In general mean recoveries, overall standard deviations (S), and single-analyst standard deviations (SR) were directly proportional to the true concentration levels. With the exception of the FID analysis of 2,4-dinitrophenol in three of the wastewaters, there were no discernible differences due to water types among mean recoveries, overall precisions, and single-analyst precisions.

This report was submitted in fulfillment of Contract No. 68-03-2625 by IT Enviroscience under sponsorship of the U.S. Environmental Protection Agency. This report covers a period from September 18, 1978 to March 30, 1984, and work was completed as of July 1, 1980.

BEGIN
LAST LINE
OF TEXT

3/8"

iv

PAGE NUMBER

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

EPA Form 2350-4 (4-80)

(PREVIOUSLY CEN. EPA FORM 687)

U.S. GOVERNMENT PRINTING OFFICE: 1980-300-000

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

CONTENTS

Foreword.....	111
Abstract.....	iv
Figures.....	vi
Tables.....	vii
Acknowledgements.....	viii
1. Introduction.....	1
2. Summary.....	3
3. Description of Study.....	11
Selection of Laboratories.....	11
Preparation of Ampuls.....	11
True Value and Stability of Concentrates.....	11
Preliminary Study.....	13
Actual Interlaboratory Study.....	14
Description and Distribution of Samples.....	14
Analysis and Reporting.....	15
Treatment of Data.....	16
Rejection of Outliers.....	16
Youden's Laboratory Ranking Procedure.....	17
Test for Individual Outliers.....	17
Statistical Summaries.....	18
Statement of Method Accuracy.....	19
Statement of Method Precision.....	20
Comparison of Accuracy and Precision Across Water Types.....	22
4. Results and Discussion.....	27
Statistical Summaries.....	27
Review and Interpretation of Data.....	68
Precision and Accuracy Regression Equations.....	73
Review of Comparison Across Water Type.....	73
Effect of Water Type with FID Detector.....	75
Effect of Water Type with EC Detector.....	76
Method Problems and Recommendations.....	76
References.....	79
Appendices	
Appendix A.....	
Results of Verification and Stability Study.....	80
Preconference Study Data Summary.....	83
Raw Data - Laboratory vs Water Type.....	85
Raw Data - Effect of Water Type.....	205
Appendix B - Method 604-Phenols.....	249

BEGIN
LAST LINE
OF TEXT

3/8"

v

PAGE NUMBER

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

FIGURES

Number

Page

A-1 to A-24 Chromatograms - Before and After Spiking.....225

6-1/2"

9-1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

vi

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 387)

PAGE NUMBER

U.S. GOVERNMENT PRINTING OFFICE: 1979-000-000

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

TABLES

<u>Number</u>		<u>Page</u>
1.	Participating Laboratories.....	2
2.	Regression Equations for Accuracy and Precision (FID).....	4
3.	Regression Equations for Accuracy and Precision (EC).....	7
4.	True Values for Phenols.....	12
5.	Sources of Surface Waters.....	15
6.	Statistical Summary - Phenol GC-FID.....	28
7.	Statistical Summary - 2,4-Dimethylphenol GC-FID.....	30
8.	Statistical Summary - 2-Chlorophenol GC-FID.....	32
9.	Statistical Summary - 4-Chloro-3-methylphenol GC-FID.....	34
10.	Statistical Summary - 2,4-Dichlorophenol GC-FID.....	36
11.	Statistical Summary - 2,4,6-Trichlorophenol GC-FID.....	38
12.	Statistical Summary - Pentachlorophenol GC-FID.....	40
13.	Statistical Summary - 2-Nitrophenol GC-FID.....	42
14.	Statistical Summary - 4-Nitrophenol GC-FID.....	44
15.	Statistical Summary - 4,6-Dinitro-2-methylphenol GC-FID.....	46
16.	Statistical Summary - 2,4-Dinitrophenol GC-FID.....	48
17.	Statistical Summary - Phenol GC-EC.....	51
18.	Statistical Summary - 2,4-Dimethylphenol GC-EC.....	52
19.	Statistical Summary - 2-Chlorophenol GC-EC.....	54
20.	Statistical Summary - 4-Chloro-3-methylphenol GC-EC.....	56
21.	Statistical Summary - 2,4-Dichlorophenol GC-EC.....	58
22.	Statistical Summary - 2,4,6-Trichlorophenol GC-EC.....	60
23.	Statistical Summary - Pentachlorophenol GC-EC.....	62
24.	Statistical Summary - 2-Nitrophenol GC-EC.....	64
25.	Statistical Summary - 4-Nitrophenol GC-EC.....	66
26.	Comparison - % Recoveries of Phenols (GC-FID).....	69
27.	Comparison - % Recoveries of Phenols (GC-EC).....	70
28.	Summary of the Test for Differences Across Water Types.....	74
A-1 to A-3	Results of Verification and Stability Study.....	80
A-4	Preconference Study Data Summary.....	83
A-5 to A-64	Raw Data - Laboratory vs. Water Type.....	95
A-65 to A-84	Raw Data - Effect of Water Type.....	205

BEGIN
LAST LINE
OF TEXT

3/8"

vii

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

ACKNOWLEDGMENTS

The authors gratefully acknowledge the diligent effort, understanding, and cooperation of the Quality Assurance Branch of EMSL-Cincinnati, who assisted in this study. They especially want to acknowledge the technical assistance and guidance of Edward L. Berg, Robert L. Graves, and Paul W. Britton.

The authors also wish to thank Amy Benson, Carol Dilworth, Karen Fox, and Peggy Mynatt for their typing and formatting skills, and a special thanks to Sybel Davis for editorial help.

9-1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

viii

PAGE NUMBER

BOTTOM OF
IMAGE AREA.
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN EPA FORM 361)

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

SECTION 1

INTRODUCTION

EPA first promulgated guidelines [1] establishing test procedures for the analysis of pollutants in 1973, following the passage of the Federal Water Pollution Control Act in 1972 by Congress. Pursuant to the amendment and publication of these guidelines, EPA entered into a Settlement Agreement-- the Consent Decree--which required the study and, if necessary, regulation of 65 "priority" pollutants and classes of pollutants of known or suspected toxicity to the biota. Subsequently, Congress passed the Clean Water Act of 1977 [2], mandating the control of toxic pollutants discharged into ambient waters by industry.

In order to facilitate the implementation of the Clean Water Act, EPA selected for initial study 129 specific toxic pollutants, 113 organic and 16 inorganic. The organic pollutants were divided into 12 categories based on their chemical structure. Analytical methods were developed by EPA for these 12 categories through in-house and contracted research and may eventually be required for the monitoring of the 113 toxic pollutants in industrial wastewater effluents, as specified by the Clean Water Act of 1977.

This report describes the interlaboratory study of Method 604-Phenols which is proposed for the Category 8 chemicals. The Category 8 chemicals are: phenol, 2,4-dimethylphenol, 2-chlorophenol, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, 2-nitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, and 2,4-dinitrophenol. The primary objective of the study was to characterize the behavior of Method 604-Phenols in terms of accuracy, overall precision, single-analyst precision, and effect of water type on accuracy and precision.

The study was conducted with the cooperation of 20 participating laboratories under auspices of the Environmental Monitoring and Support Laboratory (EMSL)-Cincinnati. Of the 20 participating laboratories, 19 were selected as the result of competitive bidding after evaluating their technical capabilities and experience in trace organic analyses of wastewater. The 20th laboratory was a volunteer from within the EPA. The participating laboratories are listed in Table 1.

The data were collected for the 20 laboratories according to Youden's [3] collaborative testing design. Formal statistical techniques compatible with the Youden design were used to identify outliers, estimate the method's accuracy and precision, and test for the effect of water type. The formal statistical analyses were carried out using the Interlaboratory Method Validation Study (IMVS) computer program [4]. The information obtained from

BEGIN
LAST LINE
OF TEXT

3/8"

1

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

the statistical analyses was summarized and reduced to a descriptive form for the purpose of interpretation and presentation.

Method 604-Phenols was developed by IT Enviroscience under a contract with the Physical and Chemical Methods Branch, EMSL-Cincinnati. Method 604-Phenols is presented in Appendix B. Briefly, the method includes extraction and concentration of the extract followed by the determination of the phenols using GC-FID. The concentrated extract may be more specifically analyzed for phenols by derivatization with pentafluorobenzyl bromide, extract cleanup on activated silica gel, and final measurement by GC-EC.

TABLE 1. PARTICIPATING LABORATORIES

Carborundum Analytical Laboratory Sacramento, CA 95823	Radian Corporation Austin, TX 78758
EMS Laboratories Indianapolis, IN 46241	Southern Research Institute Birmingham, AL 35205
Enbionics/Poison Lab MetPath Companies Denver, CO 80222	Southwest Research Institute San Antonio, TX 78284
Environmental Research & Technology Westlake Village, CA 91361	Stewart Laboratories, Inc. Knoxville, TN 37921
Environmental Research & Technology Concord, MA 01742	Syracuse Research Corporation Syracuse, NY 13210
Environmental Science & Engineering, Inc. Gainesville, FL 32604	Systems, Science & Software LaJolla, CA 92038
Foremost Foods Company Research Center Dublin, CA 94556	Texas Instruments Dallas, TX 75265
Gulf South Research Institute New Iberia, LA 70560	Wilson Laboratories Saling, KS 67401
Jacobs Engineering Group Pasadena, CA 91105	U.S. EPA Environmental Monitoring & Support Laboratory Physical & Chemical Methods Branch Cincinnati, OH 45268
Lancaster Laboratories Lancaster, PA 17601	
Monsanto Research Corporation Dayton, OH 45407	

BEGIN
LAST LINE
OF TEXT

3/8"

2

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

SECTION 2

SUMMARY

As a result of the collaborative study and the IMVS data analysis, the following conclusions can be drawn about EPA Method 604-Phenols.

- The accuracy of the method, when using either the FID or EC procedures, can be expressed as a linear function of the true concentration. In the majority of the equations the slope represents the percent recovery attributable to the method. The regression equations for accuracy are shown in Tables 2 and 3.
- The precision of the method, when using either the FID or EC procedures, can be expressed as a linear function of the mean recovery. In the majority of the equations the slope represents the relative standard deviation attributable to the method, both as single-analyst and overall standard deviations. The regression equations for precision are also shown in Tables 2 and 3.
- The average mean recovery for each compound by either FID or EC at six concentrations in seven water types compared well with data generated on distilled water and industrial effluents during development of this method.
- Six water types were used in the basic study: distilled water, nondechlorinated tap water, surface water, and three relatively interference-free industrial effluents. A seventh water, dechlorinated tap water, was also used but on a limited basis. With the exception of the FID analysis of 2,4-dinitrophenol in three of the wastewaters, no significant difference in method performance was attributable to the water type from which the analysis was performed.
- Approximately 20% of all data for the 11 compounds analyzed by the FID procedure were rejected as determined by laboratory ranking and individual outlier tests. The data rejection was found to be nonuniform among laboratories. More than 60% of the rejected data were generated by six of the 20 participating laboratories. Of the 20 participating laboratories, one had 87% of its total raw data rejected.
- Approximately 23% of all data for the nine compounds analyzed by the EC procedure were rejected as determined by laboratory ranking and individual outlier tests. The data rejection was found to be nonuniform among laboratories. More than 55% of the rejected data

BEGIN
LAST LINE
OF TEXT

3/8"

3

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

TYPING GUIDE SHEET

CENTER
OF PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

TABLE 2.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FTD

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUNDS 1 - 4

WATER TYPE	PHENOL	2,4-DIMETHYLPHENOL	2-CHLOROPHENOL	4-CHLORO-3-METHYLPHENOL
APPLICABLE CONC. RANGE	(18.40 - 252.00)	(13.00 - 151.00)	(12.20 - 185.00)	(30.00 - 450.00)
DISTILLED WATER				
SINGLE-ANALYST PRECISION	SR = 0.20X - 0.88	SR = 0.36X - 1.38	SR = 0.18X + 0.20	SR = 0.11X - 0.21
OVERALL PRECISION	S = 0.17X + 0.77	S = 0.28X + 0.30	S = 0.21X + 0.75	S = 0.16X + 1.41
ACCURACY	X = 0.43C + 0.11	X = 0.63C - 1.82	X = 0.83C - 0.84	X = 0.87C - 1.97
TAP WATER - NON DC				
SINGLE-ANALYST PRECISION	SR = 0.27X + 0.55	SR = 0.89X - 0.44	SR = 0.42X - 1.03	SR = 0.32X + 1.36
OVERALL PRECISION	S = 0.61X - 0.55	S = 0.75X + 0.14	S = 0.47X + 0.01	S = 0.48X + 1.23
ACCURACY	X = 0.28C + 0.77	X = 0.35C - 1.68	X = 1.08C - 2.91	X = 0.51C + 0.12
SURFACE WATER				
SINGLE-ANALYST PRECISION	SR = 0.19X - 0.18	SR = 0.24X - 0.18	SR = 0.21X - 0.20	SR = 0.16X + 1.18
OVERALL PRECISION	S = 0.22X - 0.04	S = 0.31X + 0.49	S = 0.28X - 0.71	S = 0.24X + 2.47
ACCURACY	X = 0.42C - 0.13	X = 0.54C - 1.40	X = 0.83C - 0.19	X = 0.82C - 1.03
WASTE WATER 1				
SINGLE-ANALYST PRECISION	SR = 0.27X + 0.15	SR = 0.24X + 1.18	SR = 0.20X + 1.21	SR = 0.32X + 2.28
OVERALL PRECISION	S = 0.36X - 0.11	S = 0.59X + 1.43	S = 0.20X + 2.89	S = 0.40X - 0.02
ACCURACY	X = 0.46C + 0.06	X = 0.51C - 1.87	X = 0.82C + 0.91	X = 0.82C - 2.07
WASTE WATER 2				
SINGLE-ANALYST PRECISION	SR = 0.25X - 1.00	SR = 0.21X + 0.52	SR = 0.21X + 0.06	SR = 0.34X - 2.67
OVERALL PRECISION	S = 0.27X + 0.69	S = 0.47X - 0.53	S = 0.25X + 0.97	S = 0.32X + 1.80
ACCURACY	X = 0.42C + 1.78	X = 0.42C - 0.58	X = 0.72C + 0.81	X = 0.81C - 1.74
WASTE WATER 3				
SINGLE-ANALYST PRECISION	SR = 0.17X + 0.24	SR = 0.57X - 1.16	SR = 0.15X + 3.05	SR = 0.17X + 1.12
OVERALL PRECISION	S = 0.27X + 0.31	S = 0.63X - 0.85	S = 0.21X + 2.82	S = 0.30X + 0.98
ACCURACY	X = 0.40C + 0.30	X = 0.47C - 0.98	X = 0.72C + 1.97	X = 0.78C - 3.60
TAP WATER - DC				
SINGLE-ANALYST PRECISION	SR = 0.24X - 0.53	SR = 0.35X - 0.38	SR = 0.19X + 0.17	SR = 0.14X + 0.68
OVERALL PRECISION	S = 0.38X - 0.92	S = 0.33X + 0.28	S = 0.25X - 0.04	S = 0.16X + 1.68
ACCURACY	X = 0.44C - 1.60	X = 0.63C - 3.37	X = 0.72C - 1.09	X = 0.61C - 4.50

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLU-
STRATIONS

TABLE 2. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUNDS 5 - 8

WATER TYPE	2,4-DICHLOROPHENOL	2,4,6-TRICHLOROPHENOL	PENTACHLOROPHENOL	2-NITROPHENOL
APPLICABLE CONC. RANGE	(14.80 - 214.00)	(20.40 - 236.00)	(16.20 - 226.00)	(25.00 - 374.00)
DISTILLED WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.17X - 0.02 S = 0.18X + 0.62 X = 0.81C + 0.48	SR = 0.10X + 0.53 S = 0.13X + 2.40 X = 0.86C + 0.40	SR = 0.22X - 0.58 S = 0.23X + 0.57 X = 0.83C + 2.07	SR = 0.15X + 0.44 S = 0.14X + 3.84 X = 0.81C + 0.78
TAP WATER - NON DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.24X - 1.56 S = 0.23X + 0.84 X = 0.78C + 0.10	SR = 0.22X - 0.13 S = 0.24X + 0.91 X = 0.92C + 0.81	SR = 0.27X - 1.26 S = 0.28X + 1.04 X = 0.82C + 0.97	SR = 0.18X - 1.79 S = 0.21X + 0.94 X = 0.79C + 1.05
SURFACE WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.17X - 0.82 S = 0.28X + 0.75 X = 0.81C + 0.23	SR = 0.17X - 0.47 S = 0.24X + 0.80 X = 0.85C + 0.25	SR = 0.16X + 2.80 S = 0.29X + 1.01 X = 0.77C + 3.99	SR = 0.19X - 1.66 S = 0.23X + 0.94 X = 0.83C + 0.92
WASTE WATER 1 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.31X - 0.33 S = 0.31X + 0.72 X = 0.77C + 1.24	SR = 0.29X - 0.63 S = 0.26X + 3.94 X = 0.83C + 3.68	SR = 0.27X + 21.40 S = 0.32X + 23.90 X = 0.75C + 33.92	SR = 0.22X - 1.17 S = 0.21X + 0.05 X = 0.80C + 0.13
WASTE WATER 2 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.27X - 0.34 S = 0.26X + 1.18 X = 0.73C + 0.04	SR = 0.01X + 12.82 S = 0.35X + 4.18 X = 0.76C + 10.29	SR = 0.32X - 1.93 S = 0.37X - 1.88 X = 0.72C + 6.27	SR = 0.21X - 0.13 S = 0.19X + 4.88 X = 0.77C + 2.90
WASTE WATER 3 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.26X - 1.36 S = 0.25X + 0.70 X = 0.73C + 1.99	SR = 0.15X - 0.56 S = 0.20X + 1.04 X = 0.82C + 0.94	SR = 0.25X + 2.99 S = 0.38X + 1.13 X = 0.79C + 1.99	SR = 0.18X - 0.04 S = 0.21X + 2.53 X = 0.77C + 1.78
TAP WATER - DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = 0.24X - 1.66 S = 0.22X - 1.39 X = 0.77C + 0.08	SR = 0.11X + 6.30 S = 0.15X + 5.01 X = 0.85C + 2.14	SR = 0.21X - 1.14 S = 0.16X + 3.71 X = 0.83C + 2.08	SR = 0.15X + 1.19 S = 0.22X + 1.92 X = 0.77C - 1.44

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

TYPING GUIDE SHEET

CENTER
OF PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

TABLE 2. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUNDS 9 - 11

WATER TYPE		4-NITROPHENOL		4,6-DINITRO-2-METHYLPHENO 2,4-DINITROPHENOL	
APPLICABLE CONC. RANGE		(29.20 - 320.00)		(27.00 - 320.00)	
DISTILLED WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.17X + 2.43$		$0.15X + 1.31$	
	S	$0.19X + 4.79$		$0.20X + 5.53$	
	X	$0.46C + 0.18$		$0.84C - 1.27$	
TAP WATER - NON DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.25X + 0.91$		$0.30X - 4.87$	
	S	$0.31X + 0.36$		$0.25X - 0.44$	
	X	$0.40C + 3.27$		$0.84C - 0.24$	
SURFACE WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.24X + 5.07$		$0.16X - 0.16$	
	S	$0.32X + 3.43$		$0.27X - 0.91$	
	X	$0.40C + 4.61$		$0.84C + 1.13$	
WASTE WATER 1 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.34X - 1.44$		$0.26X - 2.89$	
	S	$0.34X + 3.04$		$0.29X + 5.90$	
	X	$0.41C + 2.96$		$0.90C - 0.90$	
WASTE WATER 2 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.24X - 0.15$		$0.32X - 5.18$	
	S	$0.39X + 0.53$		$0.37X - 3.86$	
	X	$0.35C + 2.78$		$0.88C + 3.36$	
WASTE WATER 3 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.26X - 0.22$		$0.17X + 2.43$	
	S	$0.30X + 3.41$		$0.30X + 0.80$	
	X	$0.39C + 3.07$		$0.88C + 0.30$	
TAP WATER - DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR	$0.22X + 3.95$		$0.30X - 4.59$	
	S	$0.22X + 5.87$		$0.31X + 0.08$	
	X	$0.40C + 4.62$		$0.84C - 1.79$	

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BEGIN
LAST LINE
OF TEXT

3/8"

6

PAGE NUMBER

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

TABLE 3.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUNDS 1 - 4

WATER TYPE	APPLICABLE CONC. RANGE	PHENOL		2,4-DIMETHYLPHENOL		2-CHLOROPHENOL		4-CHLORO-3-METHYLPHENOL	
		(18.40 - 252.00)		(13.00 - 151.00)		(12.20 - 185.00)		(30.00 - 450.00)	
DISTILLED WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.21X + 0.99		SR = 0.34X + 1.03		SR = 0.41X + 0.59		SR = 0.31X + 1.06	
		S = 0.4X + 1.40		S = 0.67X + 0.24		S = 0.52X + 0.09		S = 0.53X + 1.18	
		X = 0.36C - 0.05		X = 0.67C - 1.15		X = 0.55C + 0.16		X = 0.72C - 3.97	
TAP WATER - NON DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.54X + 0.02		SR = 0.77X + 0.26		SR = 0.65X + 3.44		SR = 0.38X + 0.19	
		S = 0.72X + 0.01		S = 0.79X + 0.40		S = 0.53X + 0.71		S = 0.65X + 0.16	
		X = 0.31C - 0.73		X = 0.25C + 1.11		X = 0.80C - 2.08		X = 0.47C - 3.69	
SURFACE WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.33X + 1.13		SR = 0.26X + 2.75		SR = 0.35X + 0.98		SR = 0.22X + 6.26	
		S = 0.29X + 3.95		S = 0.42X + 2.60		S = 0.43X + 1.57		S = 0.47X + 2.10	
		X = 0.33C + 1.98		X = 0.49C - 0.26		X = 0.57C + 0.44		X = 0.63C + 0.58	
WASTE WATER 1 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.54X + 1.70		SR = 0.55X + 1.08		SR = 0.42X + 0.95		SR = 0.52X + 3.59	
		S = 0.48X + 2.05		S = 0.50X + 0.60		S = 0.47X + 2.20		S = 0.52X + 3.57	
		X = 0.30C + 0.40		X = 0.41C - 0.16		X = 0.54C + 0.29		X = 0.55C + 0.32	
WASTE WATER 2 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.37X + 0.16		SR = 0.70X + 0.96		SR = 0.45X + 1.11		SR = 0.31X + 0.09	
		S = 0.39X + 3.71		S = 0.77X + 0.01		S = 0.49X + 2.35		S = 0.36X + 8.03	
		X = 0.36C + 2.94		X = 0.52C + 0.50		X = 0.73C - 0.19		X = 0.59C + 3.19	
WASTE WATER 3 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.29X + 1.67		SR = 0.32X + 1.55		SR = 0.60X + 2.32		SR = 0.40X + 2.00	
		S = 0.55X + 1.05		S = 0.60X + 1.58		S = 0.68X + 1.58		S = 0.54X + 2.35	
		X = 0.32C + 0.57		X = 3.39C + 4.52		X = 0.71C + 0.35		X = 0.48C + 3.21	
TAP WATER - DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY		SR = 0.33X + 0.92		SR = 0.45X + 1.39		SR = 0.26X + 0.81		SR = 0.32X + 3.35	
		S = 0.58X + 0.43		S = 0.70X + 1.67		S = 0.56X + 0.23		S = 0.58X + 3.28	
		X = 0.28C + 0.93		X = 0.59C - 0.50		X = 0.50C + 0.40		X = 0.54C + 5.39	

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

TABLE 3. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-17 ENV PHENOLS:EC

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUNDS 5 - 8

WATER TYPE	2,4-DICHLOROPHENOL APPLICABLE CONC. RANGE	2,4,6-TRICHLOROPHENOL (120.40 - 236.00)	PENTACHLOROPHENOL (16.20 - 226.00)	2-NITROPHENOL (25.00 - 374.00)
DISTILLED WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.17X + 2.16$ S = $0.37X + 1.53$ X = $0.73C - 2.21$	SR = $0.32X - 0.51$ S = $0.34X + 2.80$ X = $0.80C - 4.16$	SR = $0.33X - 0.92$ S = $0.45X - 0.15$ X = $0.74C - 2.34$	SR = $0.26X + 1.66$ S = $0.39X + 2.97$ X = $0.60C - 2.64$
TAP WATER - NON DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.44X - 1.96$ S = $0.52X - 0.33$ X = $0.77C - 3.74$	SR = $0.42X - 3.77$ S = $0.44X - 1.11$ X = $0.83C - 3.27$	SR = $0.35X + 1.06$ S = $0.42X + 0.64$ X = $0.70C - 1.57$	SR = $0.30X - 0.74$ S = $0.45X + 0.29$ X = $0.58C - 1.53$
SURFACE WATER SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.35X + 1.51$ S = $0.46X + 1.32$ X = $0.71C - 0.65$	SR = $0.26X + 5.54$ S = $0.36X + 3.63$ X = $0.83C + 2.41$	SR = $0.35X + 0.41$ S = $0.51X + 0.03$ X = $0.63C - 2.46$	SR = $0.32X + 1.86$ S = $0.45X + 2.43$ X = $0.55C + 2.40$
WASTE WATER 1 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.40X + 0.06$ S = $0.43X + 0.78$ X = $0.71C - 0.20$	SR = $0.33X + 0.21$ S = $0.44X + 1.70$ X = $0.78C - 0.33$	SR = $0.53X - 4.49$ S = $0.55X + 23.33$ X = $0.73C + 36.34$	SR = $0.35X - 0.82$ S = $0.46X + 0.25$ X = $0.58C + 1.08$
WASTE WATER 2 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.38X + 1.69$ S = $0.45X + 1.15$ X = $0.71C + 0.60$	SR = $0.56X - 2.68$ S = $0.41X + 2.03$ X = $0.71C - 0.41$	SR = $0.38X + 0.22$ S = $0.38X + 0.32$ X = $0.66C + 0.48$	SR = $0.37X - 1.65$ S = $0.42X + 2.17$ X = $0.61C - 0.20$
WASTE WATER 3 SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.33X + 0.83$ S = $0.43X + 1.08$ X = $0.70C - 1.05$	SR = $0.24X + 1.52$ S = $0.32X + 2.24$ X = $0.66C + 2.28$	SR = $0.24X + 0.04$ S = $0.55X - 0.03$ X = $0.56C + 1.27$	SR = $0.42X - 0.21$ S = $0.51X - 0.38$ X = $0.56C - 0.98$
TAP WATER - DC SINGLE-ANALYST PRECISION OVERALL PRECISION ACCURACY	SR = $0.37X - 0.63$ S = $0.61X - 2.82$ X = $0.98C - 4.76$	SR = $0.33X - 2.02$ S = $0.39X - 2.70$ X = $0.82C - 1.61$	SR = $0.14X + 0.02$ S = $0.15X + 0.36$ X = $0.89C + 0.78$	SR = $0.11X + 2.36$ S = $0.46X - 1.40$ X = $0.66C - 1.61$

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

TYPING GUIDE SHEET

CENTER
OF PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

TABLE 3. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

REGRESSION EQUATIONS FOR ACCURACY AND PRECISION FOR COMPOUND 9

4-NITROPHENOL	
WATER TYPE	APPLICABLE CONC. RANGE
	(28.20 - 320.00)
DISTILLED WATER	
SINGLE-ANALYST PRECISION	$SR = 0.37X + 0.29$
OVERALL PRECISION	$S = 0.48X + 1.21$
ACCURACY	$X = 0.43C - 2.55$
TAP WATER - NON DC	
SINGLE-ANALYST PRECISION	$SR = 0.39X - 0.16$
OVERALL PRECISION	$S = 0.41X + 1.03$
ACCURACY	$X = 0.35C - 2.64$
SURFACE WATER	
SINGLE-ANALYST PRECISION	$SR = 0.28X + 3.04$
OVERALL PRECISION	$S = 0.43X + 0.08$
ACCURACY	$X = 0.32C + 0.75$
WASTE WATER 1	
SINGLE-ANALYST PRECISION	$SR = 0.32X + 1.71$
OVERALL PRECISION	$S = 0.39X + 2.96$
ACCURACY	$X = 0.34C + 7.34$
WASTE WATER 2	
SINGLE-ANALYST PRECISION	$SR = 0.20X + 2.97$
OVERALL PRECISION	$S = 0.28X + 1.95$
ACCURACY	$X = 0.40C + 0.45$
WASTE WATER 3	
SINGLE-ANALYST PRECISION	$SR = 0.50X - 1.94$
OVERALL PRECISION	$S = 0.64X - 0.73$
ACCURACY	$X = 0.36C - 0.37$
TAP WATER - DC	
SINGLE-ANALYST PRECISION	$SR = 0.11X + 2.66$
OVERALL PRECISION	$S = 0.41X - 0.20$
ACCURACY	$X = 0.33C - 0.09$

X = MEAN RECOVERY
C = TRUE VALUE FOR THE CONCENTRATION

BEGIN
LAST LINE
OF TEXT

3/8"

9

PAGE NUMBER

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

was generated by six of the 20 participating laboratories. Of the 20 participating laboratories, two had more than 63% of their total raw data rejected.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

- Some of the problems encountered in applying the method during this study included: Several laboratories had a problem with the separation of 4,6-dinitro-2-methylphenol and 2,4-dinitrophenol when using the SP-1240DA column during use of the FID procedure. For each method of detection at least one laboratory had a problem in distinguishing between peaks in the standard mixture. One laboratory had trouble in concentrating the extract using the Kuderna-Danish apparatus. Some of the laboratories had to use peak height measurements for quantitation because occasional interference peaks in wastewater created faulty integration when using recording integrators.
- Results from the limited study comparing the method's performance on both nondechlorinated and dechlorinated tap water prove the need to dechlorinate samples for phenols analysis as soon as possible after sample collection.
- Direct comparison of the FID and EC procedures for the analysis of the nine common Category 8 chemicals (the two dinitrophenols are determined by GC-FID only) indicates that the FID technique yielded fewer outliers, lower overall and single-analysis standard deviations, and higher mean recoveries.

BEGIN
LAST LINE
OF TEXT

3/8"

10

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

SECTION 3

DESCRIPTION OF STUDY

The interlaboratory study design was based on Youden's plan [3] for collaborative evaluation of precision and accuracy for analytical methods. According to Youden's design, samples are analyzed in pairs. A Youden pair consists of two samples at similar, but distinctly different concentrations. The analyst is requested to do only a single analysis for each sample and therefore report only one value as in normal routine use of the method.

SELECTION OF LABORATORIES

Over 60 laboratories throughout the United States were contacted by telephone and asked about their interest and experience in this type of interlaboratory study. Approximately 40 bid packages were sent to interested laboratories, and these packages included a request for a price quote and information on their capabilities in trace organic analyses of wastewater. From the 36 bids received, 19 laboratories were selected because of their technical capabilities and experience in this area. Three volunteer laboratories from within the EPA initially were part of the program, but two of them dropped from the project because of other work demands. The total interlaboratory study therefore included 20 laboratories.

PREPARATION OF AMPULS

All starting materials used were reagent grade or better. Separate stock solutions of each of the eleven phenols were prepared by dissolving precisely weighed amounts of the compound into separate Class A volumetric flasks. The solvent used was distilled in glass 2-propanol. Appropriate volumes of the stock solutions were mixed and diluted to volume in a 2000-mL volumetric flask. The flask was refrigerated overnight at 4°C. The following day, approximately 3 mL of the refrigerated solution was transferred into 5-mL glass ampuls using an all-glass or Teflon[®] delivery system. After the ampuls were cooled in a freezer at -30°C for three hours, they were sealed by a professional glass blower using the pull-and-twist technique.

When diluted to volume in the water type according to the instructions, the samples contained the concentrations of the phenols shown in Table 4.

TRUE VALUE AND STABILITY OF CONCENTRATES

BEGIN
LAST LINE
OF TEXT

3/8"

11

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

TABLE 4. TRUE VALUES* FOR PHENOLS
($\mu\text{g/L}$ IN WATER)

Compound	Ampul 1	Ampul 2	Ampul 3	Ampul 4	Ampul 5	Ampul 6
Phenol	20.4	18.4	101	252	91.2	228
2,4-Dimethylphenol	13.0	15.2	30.4	122	37.6	151
2-Chlorophenol	14.6	12.2	37.0	185	30.4	152
4-chloro-3-Methylphenol	30.0	36.0	150	374	180	450
2,4-Dichlorophenol	14.8	17.0	112	186	129	214
2,4,6-Trichlorophenol	20.4	23.6	50.2	200	59.0	236
Pentachlorophenol	17.8	16.2	135	226	121	202
2-Nitrophenol	25.0	30.0	124	312	150	374
4-Nitrophenol	28.2	32.0	210	280	240	320
4,6-Dinitro-2-Methylphenol	29.8	33.6	149	298	169	338
2,4-Dinitrophenol	32.0	27.0	160	320	136	272

* The true value stated for a parameter is the actual value calculated by weight for that parameter. Subsequent analyses were for verification only.

BEGIN
LAST LINE
OF TEXT

3/8"

12

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

An important segment of this study was to verify the true values and stability of the phenols in the 2-propanol concentrates before they were used in the study. To achieve this verification, three replicate ampuls were randomly selected from each concentrate level batch and analyzed by triplicate injection into a gas chromatograph equipped with a recording integrator. To check stability these analyses were carried out at 0, 45, and 90 days after the ampuls were sealed and before the study was started. All concentrate values determined experimentally were within instrumental error of the calculated true values. The results of the stability and verity study are presented in Tables A-1 through A-3 of the appendix.

PRELIMINARY STUDY

Previous EPA method studies have shown that more realistic results can be obtained if all participants fully understand the analytical and sample handling procedures before undertaking the full study. To familiarize the analyst with the analytical method and handling procedures, each of the 20 laboratories was sent a low-level Youden pair of sample concentrates (different from those to be used in the actual study) for spiking distilled water. The analysts were also sent instructions, a copy of the method, and data report sheets.

The results of these analyses were collected, statistically analyzed, and discussed with the laboratories' representatives at a one-day conference. A summary of the preliminary data is presented in Table A-4 of the appendix. The meeting also allowed discussion of analytical problems and clarification of any procedure steps.

One of the problems discussed at the meeting was the sources of phenols, i.e., the dinitrophenols and the derivatization reagents. The names of several vendors were suggested by IT Enviroscience and the participants. A few laboratories had experienced accuracy problems with commercially available stock solutions. It was recommended that the laboratories prepare their own stock solutions from standard materials as specified in the method. Another problem discussed was that a large solvent peak caused some laboratories to experience poor flame ionization sensitivity for the early eluting phenol compounds. To keep the solvent peak reasonable, the instrument had to be run at a lower sensitivity. Through conversation with the participants, the problem was traced to excess dead volume in the injection port. Instruments with true on-column injection experienced no problems with the 2-propanol solvent peak.

The major problem encountered by nine of the laboratories was the separation of the two dinitrophenols on the 1% SP-1240DA column, which was advertised to provide such a separation. After the meeting, IT Enviroscience contacted the manufacturer and discussed the problem. The manufacturer provided IT Enviroscience with a new batch of the 1% SP-1240DA packing which was evaluated and found satisfactory by IT Enviroscience. All laboratories having problems with the separation were requested to order that batch. The laboratories also were instructed to follow closely the column conditioning procedures recommended by the manufacturer to avoid future problems.

BEGIN
LAST LINE
OF TEXT

3/8"

13

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

ACTUAL INTERLABORATORY STUDY

A summary of the test design using Youden's nonreplicate technique based on pairs with slightly dissimilar analyte concentrations is given below:

- Twenty laboratories were sent three Youden pairs in sealed glass ampuls containing various levels of the 11 phenols in 2-propanol.
- When the analyst was ready to start the analyses, the ampuls were opened and aliquots were diluted to volume in the appropriate water types according to instructions.
- Each sample (ampul) was analyzed only once.
- The six water types were analyzed with and without spiking, and the added level of constituent was determined by difference and reported as $\mu\text{g/L}$ in each water sample.
- The three levels of phenols used in the study were within the working range of the method and represent the range of levels one would normally expect to encounter in application of the method to actual samples.

DESCRIPTION AND DISTRIBUTION OF SAMPLES

The individual laboratories provided their own samples of laboratory-distilled water, tap water, and a local surface water. The surface waters that the laboratories used in the study are listed in Table 5. The drinking waters were from the individual laboratory taps. The sources of wastewater effluent samples provided by IT Envirosience are described as follows:

- Wastewater No. 1 - Effluent from an industrial waste treatment system, including primary and secondary activated sludge treatment, followed by lagooning for up to 90 days. Wastewater source is a large producer of organic chemicals, including intermediates, pesticides, and plastics, with several chlorinated benzenes, phenol, and chlorinated phenols produced or handled.
- Wastewater No. 2 - Effluent from an industrial primary and secondary activated sludge treatment system followed by tertiary activated carbon treatment. Wastewater source is a large producer of inorganic and organic chemicals, including chemical intermediates, chlorinated and nitrated pesticides, with several Category 3 compounds produced or used as raw materials.
- Wastewater No. 3 - Effluent from an industrial wastewater treatment plant consisting of API oil/water separators, rapid sand filtering, an equalization tank, rotating biological contactors, and final clarifiers. The wastewater source is a Class B refinery producing gasoline, kerosene, jet fuel, heating oils, heavy fuels, and LPG.

BEGIN
LAST LINE
OF TEXT

3/8"

14

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

The three wastewater types represented three industrial plant effluents on which the method was intended to be utilized.

TABLE 5. SOURCES OF SURFACE WATERS USED IN THE STUDY

Bayou Teche	New Iberia, LA
Cahaba River	Birmingham, AL
Cherry Creek	Denver, CO
Duck Creek	Garland, TX
Eagle Creek Reservoir	Indianapolis, IN
Horn Pond	Woburn, MA
Hogtown Creek	Gainesville, FL
Glendale Reservoir	Glendale, CA
Great Miami River	Dayton, OH
Ohio River	Cincinnati, OH
Onondaga Lake	Syracuse, NY
Sacramento River	Before Confluence of American River, CA
San Pedro Springs	San Antonio, TX
Smoky Hill River	Salina, KS
South Bay Aqueduct	San Francisco, CA
Susquehanna River	Lancaster, PA
Tennessee River	Knoxville, TN
Los Pana Squitos	Sorrento Valley, CA
Barton Springs Creek	Austin, TX
West Lake	Westlake Village, CA

The wastewater samples were collected as grab samples in 55-gallon stainless steel drums which had been precleaned with acetone, methylene chloride, and distilled water. Upon receipt by IT Enviroscience, the unfiltered effluent samples were mixed and transferred into 1-quart bottles using an all-Teflon system and stored in a refrigerator at 4°C until shipment to the laboratories.

After a laboratory demonstrated satisfactory separation of the compounds with the 1% SP-1240DA column packing, it was sent 36 ampul concentrates (six sets of three Youden pairs), seven one-quart bottles each of three wastewater types, instructions, and data report sheets. The wastewaters were packed in ice in coolers and sent by air freight to minimize sample change and assure comparability of the wastewaters from laboratory to laboratory.

Figures A-1 through A-24 in the appendix show chromatograms of clean (distilled) water and the three wastewaters before and after spiking.

ANALYSIS AND REPORTING

A water spiking technique involving a water-miscible solvent concentrate (2-propanol) was used in this study. Each analyst was instructed to add separate 2.0 mL aliquots of each concentrate to the bottle containing

BEGIN
LAST LINE
OF TEXT

2/8"

BOTTOM OF
IMAGE AREA/
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

approximately 1 L of water or wastewater. The spiked sample was to be stirred for 15 minutes and then handled as a sample according to the method. The results of the method's measurement for each constituent (in micrograms per liter of water) were then corrected by subtracting any blank sample reading and reported on data sheets by ampul and water type. The method utilized by the participating laboratories, Method 604-Phenols, is presented in Appendix B. There were no reported deviations.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

IT Enviroscience reviewed the data for completeness and abnormal results. The data were then entered into the computer for statistical treatment. Any laboratory reporting unusually high or low data was requested to review its data for any possible errors in calculation but was not told how the reported data varied from the true values.

TREATMENT OF DATA

The objective of this interlaboratory study was to obtain information about the accuracy and precision associated with measurements generated by Method 604-Phenols. This objective was met by using statistical analysis techniques designed to extract and summarize the relevant information about accuracy and precision from the data reported by the participating laboratories. The statistical techniques were similar to the techniques recommended in the ASTM Standard Practice D2777-77.

The algorithms required to perform the statistical analyses were integrated into a system of computer programs referred to as IMVS. The analyses performed by IMVS [4] included several tests for the rejection of outliers (laboratories and individual data points), summary statistics by concentration level for mean recovery (accuracy), overall and single-analyst standard deviation (precision), determination of the linear relationship between mean recovery and concentration level, determination of the linear relationship between the precision statistics and mean recovery, and a test for the effect of water type on accuracy and precision.

A detailed description of each of the statistical analysis procedures is presented below.

Rejection of Outliers

Spurious data points are always a part of any set of data collected during an interlaboratory test program. It is important to identify and remove these data points because they can lead to values of summary statistics which are not representative of the general behavior of the method. However, some erratic behavior in the data may be directly related to some facet of the method under the study. Therefore, spurious data points should not be removed indiscriminately, and any points that are removed should be clearly identified since further investigation of the analytical conditions related to the outliers might be of value. Data rejected as outliers for this study as a result of any of the following tests for outliers were identified by the symbol "*" in the raw data tables.

BEGIN
LAST LINE
OF TEXT

3/8"

16

BOTTOM OF
IMAGE AREA
CUTTING
MARGINS FOR
TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

Youden's Laboratory Ranking Procedure

In some cases the analytical values reported by a specific laboratory were so consistently high or low that a large systematic error may be attributed to that laboratory. These data are not representative of the method and should be rejected. Youden's [3] ranking test for outlying laboratories was applied separately to data from each of the waters used in this study. Since six water types were used in this study, the laboratory ranking procedure was applied to these six different subsets of the data. Each laboratory ranking test was performed at the 5% level of significance.

The Youden laboratory ranking procedure requires a complete set of data from every laboratory within a given water type. Missing data from laboratory i for water type j were replaced by the following procedure. Letting X_{ijk} denote the reported measurement from laboratory i for water type j and concentration level C_k , it is assumed that

$$X_{ijk} = \beta_j \cdot C_k^{\gamma_j} \cdot L_i \cdot \epsilon_{ijk}$$

where β_j and γ_j are fixed parameters which determine the effect of water type j , L_i is the systematic error due to laboratory i and ϵ_{ijk} is the random within laboratory error. Taking natural logarithms, it follows that

$$\ln X_{ijk} = \ln \beta_j + \gamma_j \ln C_k + \ln L_i + \ln \epsilon_{ijk}$$

which is a linear regression model with dependent variable $\ln X_{ijk}$ and independent variable $\ln C_k$. (Details and justification for this model are discussed in the section "Comparison of Accuracy and Precision Across Water Types.")

The natural logarithms of an individual laboratory's data were regressed against the natural logarithms of the true concentration levels for the six ampuls in each water type. The predicted values $\ln \hat{X}_{ijk}$ were obtained from the regression equation, and the missing values for X_{ijk} were estimated by $\hat{X}_{ijk} = \exp(\ln \hat{X}_{ijk})$, where $\exp(X)$ denoted the constant e raised to the power X .

If the ranking test rejected a laboratory for a specific water type, then all of the laboratory's data for that water type were rejected as outliers. The rejected values were excluded from all the remaining analyses. In addition, after completion of the laboratory ranking procedure, the predicted values created to fill in for the missing data were rejected and excluded from further analyses for all laboratories.

Test for Individual Outliers

The data remaining after the laboratory ranking procedure were grouped by water type. For each water type, the data were broken down into six subsets defined by the six concentration levels (ampuls) used in the study. For each subset of the data, all missing, zero, "less than" and "nondetect" data were rejected. Next, the test for individual outliers constructed by

BEGIN
LAST LINE
OF TEXT

3/8"

17

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

Thompson [5], and suggested in the ASTM Standard Practice D2777-77, was applied to the data using a 5% significance level. If an individual data point was rejected based on this test, it was removed from the subset, and the test was repeated using the remaining data in the subset. This process was continued until no additional data could be rejected.

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

STATISTICAL SUMMARIES

Several summary statistics were calculated using the data remaining for each concentration level after the outlier rejection tests were performed. These summary statistics included: the number of retained data points, the mean recovery, accuracy as a percent relative error, the absolute overall standard deviation, the percent relative overall standard deviation, the absolute single-analyst standard deviation, and the percent relative single-analyst standard deviation. The basic formulae used to calculate these statistics are presented below where $X_1, X_2, \dots, X_n$ denote the values of the n retained data points for a specific concentration level:

Mean Recovery ($\bar{X}$):

6-1/2"

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$$

The usual concentration notation for mean recovery is $\bar{X}$; however, the symbol $\bar{X}$ is used in this report to be consistent with the IMVS output.

Accuracy as a % Relative Error:

$$\%RE = \frac{\bar{X} - \text{True Value}}{\text{True Value}} \times 100$$

Overall Standard Deviation:

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2}$$

and

Percent Relative Overall Standard Deviation:

$$\%RSD = \left(\frac{S}{\bar{X}} \right) \times 100$$

The overall standard deviation S indicates the precision associated with measurements generated by a group of laboratories. This represents the broad variation in the data collected in an interlaboratory study. However, a measure of how well an individual analyst can expect to perform in his own laboratory is another important measure of precision. This single-analyst precision, denoted by SR , was estimated for each Youden pair by

$$SR = \sqrt{\frac{1}{2(m-1)} \sum_{i=1}^m (D_i - \bar{D})^2}$$

BEGIN
LAST LINE
OF TEXT

3/8"

18

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

where

m = the number of complete sets of Youden pair observations remaining after outliers have been removed,

D_i = the difference between the observations in the i th Youden pair

and

$\bar{D}$ = average of the D_i values.

The percent relative single-analyst standard deviation was calculated by

$$\%RSD-SR = \frac{SR}{X^*} \times 100$$

where X^* is the average of the two mean recovery statistics corresponding to the two concentration levels defining the particular Youden pair.

These summary statistics provide detailed information on the accuracy and precision of the data obtained for each concentration level. One objective of the statistical analysis of the data is to summarize the information about accuracy and precision which is contained in the statistics.

A systematic relationship exists between the mean recovery (X) and the true concentration level (C) of the analyte in the sample. In addition, there are often systematic relationships between the precision statistics (S and SR) and the mean recovery (X). Usually these systematic relationships can be adequately approximated by a linear relationship (i.e. a straight line). Once these straight lines are established, they can be used to conveniently summarize the behavior of the method within a water type, and they can aid in comparing the behavior of the method across water types. In addition they can be used to obtain estimates of the accuracy and precision at any concentration level within the applicable range studied. They can also be used to predict the behavior of the method when used under similar conditions. These important relationships are discussed below.

STATEMENT OF METHOD ACCURACY

The accuracy of the method is characterized by the relationship of the mean recovery (X) to the true concentration (C) of the analyte in the water sample. In order to obtain a mathematical expression for this relationship, a regression line of the form

$$X = a + b \cdot C \quad (1)$$

was fitted to the data by regression techniques.

It is often the case that the true concentration values vary over a wide range. In such cases, the mean recovery statistics associated with the

BEGIN
LAST LINE
OF TEXT

3/8"

19

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

larger concentration values tend to dominate the fitted regression line producing relatively larger errors in the estimates of mean recovery at the lower concentration values. In order to eliminate this problem, a weighted least squares technique was used to fit the mean recovery data to the true concentration values. The weighted least squares technique was performed by dividing both sides of Equation (1) by C resulting in Equation (2).

DROPPED
HEAD.
BEGIN
SECTIONS
HERE

$$\frac{X}{C} = a \cdot \frac{1}{C} + b \quad (2)$$

The (X/C) values were regressed against the (1/C) values using ordinary least squares to obtain estimates for the values of a and b. (This is equivalent to performing a weighted least squares with weights $w = 1/C^2$; see Reference [6], page 108 for details.) Equation (2) can easily be converted to the desired relationship given by Equation (1). The intercept (b) from Equation (2) becomes the slope (b) for Equation (1) and the slope (a) from Equation (2) becomes the intercept (a) for Equation (1). Equation (1) can be used to calculate the percent recovery over the applicable range of concentrations used in the study.

The percent recovery is given by

$$\text{Percent Recovery} = \left[\frac{a + b \cdot C}{C} \right] \times 100 = \left[\frac{a}{C} + b \right] \times 100 \quad (3)$$

If the absolute value of the ratio (a/C) is small relative to the slope (b) for concentrations in the low end of the range of concentration levels used in the study, then the percent recovery can be approximated by $b \times 100$. For example, suppose the true concentration values range from 25 µg/L to 515 µg/L, the fitted line is given by $X = -0.20 + 0.85 \cdot C$. The percent recovery would be approximated by $(0.85) \times 100 = 85\%$ over the specified range of 25 µg/L to 515 µg/L.

If the ratio (a/C) is not small relative to the slope (b), then the percent recovery depends upon the true concentration (C), and it must be evaluated at each concentration value within the specified range.

STATEMENT OF METHOD PRECISION

The precision of the method is characterized by the relationships between precision statistics (S and SR) and mean recovery (X). In order to obtain a mathematical expression for these relationships, regression lines of the form

$$S = d + e \cdot X \quad (4)$$

and

$$SR = f + g \cdot X \quad (5)$$

were fitted to the data.

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA.
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

As discussed previously with respect to accuracy, the values of X and X^* often vary over a wide range. In such cases the standard deviation statistics associated with the larger mean recovery values will dominate the regression lines. This will produce relatively larger errors in the estimates of S and SR at the lower mean recovery values. Therefore, a weighted least squares technique was also used to establish the values of the parameters d , e , f , and g in Equations (4) and (5). The weighted least squares technique was performed by dividing both sides of Equation (4) by X , resulting in Equation (6)

$$\frac{S}{X} = d \cdot \frac{1}{X} + e \quad (6)$$

and by dividing both sides of Equation (5) by X^* resulting in Equation (7)

$$\frac{SR}{X^*} = f \cdot \frac{1}{X^*} + g \quad (7)$$

The (S/X) values were regressed against the $(1/X)$ values and the (SR/X^*) values were regressed against the $(1/X^*)$ values using ordinary least squares to obtain estimates for the parameters d , e , f , and g .

Equations (4) and (5) were obtained from Equations (6) and (7) in a manner similar to that discussed for mean recovery. The slope (d) for Equation (6) is the intercept (d) for Equation (4), and the intercept (e) for Equation (6) is the slope (e) for Equation (4). Similarly, the slope (f) for Equation (7) is the intercept (f) for Equation (5), and the intercept (g) for Equation (7) is the slope (g) for Equation (5).

Given Equations (4) and (5), the percent relative overall standard deviation and the percent relative single-analyst standard deviation are

$$\%RSD = \left[\frac{d}{X} + e \right] \times 100 \quad (8)$$

and

$$\%RSD-SA = \left[\frac{f}{X^*} + g \right] \times 100 \quad (9)$$

respectively. If the absolute value of the ratio (d/X) is small relative to the slope (e), then the percent relative overall standard deviation can be approximated by $(e \times 100)$ over the applicable range of mean recovery values. Similarly if the ratio (f/X^*) is small relative to the slope (g), then the percent relative single-analyst standard deviation can be approximated by $(g \times 100)$ over the applicable range of mean recovery values.

If the ratios (d/X) and (f/X^*) are not small relative to the slopes (e) and (g), then the percent relative standard deviations depend upon the

BEGIN
LAST LINE
OF TEXT

3/8"

21

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

values of the mean recovery statistics X and X^* , and they should be evaluated separately for each value of X and X^* .

COMPARISON OF ACCURACY AND PRECISION ACROSS WATER TYPES

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

It is possible that the accuracy and precision of Method 604-Phenols depend upon the type of water being analyzed. The summary statistics X , S , and SR are calculated separately for each concentration level within each water type. They can be compared across water types in order to obtain information about the effects of water type on accuracy and precision. However, the use of these summary statistics in this manner has several disadvantages. First, it is cumbersome since there are 36 mean recovery statistics (X) (six concentrations $\times$ six waters), 36% of the overall standard deviation statistics (S) and 18 precision statistics (SR) calculated for each compound. Comparison of these statistics across concentration levels and across water types becomes unwieldy. Second, the statistical properties of this type of comparisons procedure are difficult to determine. Finally, due to variation associated with X , S , and SR , comparisons based on these statistics can lead to inconsistent conclusions about the effect of water type. For example, distilled water may produce a significantly lower value than surface water for the precision statistic S at a high concentration, but a significantly higher value for S at a low concentration.

An alternative approach described in detail [7], has been developed to test for the effects of water type. This alternative approach is based on the concept of summarizing the average effect of water type across concentration levels rather than studying the local effects at each concentration level. If significant differences are established by this alternative technique, then the summary statistics can be used for further local analysis.

The test for the effect of water type is based on the following statistical model. If S_{ijk} denotes the measurement reported by laboratory i , for water type j , and ampul k , then

$$X_{ijk} = \beta_j \cdot C_k^{\gamma_j} \cdot L_i \cdot \epsilon_{ijk} \quad \begin{array}{l} i = 1, 2, \dots, n \\ j = 1, 2, \dots, 6 \\ k = 1, 2, \dots, 6 \end{array} \quad (10)$$

The model components β_j and γ_j are fixed parameters which determine the effect of water type j on the behavior and observed measurements (X_{ijk}). The parameter C_k is the true concentration level associated with ampul k . The model component L_i is a random factor which accounts for the systematic error associated with laboratory i . The model component ϵ_{ijk} is the random factor which accounts for the within laboratory error.

The model is designed to approximate the global behavior of the data. The multiplicative structure was chosen because of two important properties. First, it allows for a possible curvilinear relationship between the data

BEGIN
LAST LINE
OF TEXT

3/8"

22

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

(X_{ijk}) and the true concentration level C_k through the use of the exponent γ_j on C_k . This makes the model more flexible in comparison to straight line models. Second, as will be seen below, there is an inherent increasing relationship between the variability in the data and the concentration level C_k in this model. This property is important because it is typical of interlaboratory data collected under conditions where the true concentration levels vary widely.

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

Accuracy is related directly to the mean recovery or expected value of the measurements (X_{ijk}). The expected value for the data modeled by Equation (10) is

$$E(X_{ijk}) = \beta_j \cdot C_k^{\gamma_j} \cdot E(L_i \cdot \epsilon_{ijk}) \quad (11)$$

Precision is related to the variability in the measurements (X_{ijk}). The variance of the data modeled by Equation (10) is

$$\text{Var}(X_{ijk}) = \left[\beta_j C_k^{\gamma_j} \right]^2 \text{Var}(L_i \cdot \epsilon_{ijk}) \quad (12)$$

which is an increasing function of C_k . (See Reference [4] for a complete discussion of this model.)

The accuracy and precision of Method 604-Phenols depend upon water type through Equations (11) and (12) and the parameters (β_j) and (γ_j). If the (β_j) and (γ_j) vary with j (i.e. vary across water type), then the accuracy and precision of the method also vary across water type.

In order to determine if these parameters do vary across water type and to compare their values, they must be estimated from the laboratory data using regression techniques. Equation (10) represents the basic model. However, taking natural logarithms of both sides of Equation (10), the following straight line regression model is obtained,

$$\ln X_{ijk} = \ln \beta_j + \gamma_j \ln C_k + \ln L_i + \ln \epsilon_{ijk} \quad (13)$$

which can be analyzed using standard linear model analysis techniques. The parameter $\ln \beta_j$ is the intercept and γ_j the slope of the regression line associated with water type j . It is assumed that $\ln L_i$ is normally distributed with mean 0 and variance σ_e^2 , and that $\ln \epsilon_{ijk}$ is normally distributed with mean 0 and variance σ_e^2 , and that the ($\ln L_i$) and ($\ln \epsilon_{ijk}$) terms are independent.

Based on Equation (13) the comparison of water types reduces to the comparison of straight lines. Distilled water is viewed as a control, and each of the remaining lines is compared directly to the line for distilled water.

Using the data on the log-log scale and regression techniques, the parameters $\ln \beta_j$ (and hence β_j) and γ_j can be estimated. The estimates are

BEGIN
LAST LINE
OF TEXT

3/8"

23

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

then used to test the null hypothesis that there is no effect due to water type. The formal null and alternative statistical hypotheses H_0 and H_A are given by

$$H_0: \ln \beta_j - \ln \beta_1 = 0 \text{ and } \gamma_j - \gamma_1 = 0 \text{ for } j = 2, 3, 4, 5, 6$$

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

versus

$$H_A: \ln \beta_j - \ln \beta_1 \neq 0 \text{ and/or } \gamma_j - \gamma_1 \neq 0 \text{ for some } j = 2, 3, 4, 5, 6$$

The test of null hypothesis H_0 against the alternative hypothesis H_A is based on an F-statistic derived from standard linear model theory. The probability of obtaining a value of an F-statistic as large as the value which was actually observed (F OBS), denoted by $P(F > F \text{ OBS})$, is calculated under the assumption that H_0 is true. The null hypothesis H_0 is rejected in favor of H_A if $P(F > F \text{ OBS})$ is less than 0.05.

If H_0 is rejected, then some linear combination of the differences $\ln \beta_j - \ln \beta_1$ and $\gamma_j - \gamma_1$ is statistically different from zero. However, this does not guarantee there will be a statistically significant direct effect attributable to any specific water type since the overall F test can be overly sensitive to minor systematic effects common to several water types. The effect due to water type is judged to be statistically significant only if one of the differences $\ln \beta_j - \ln \beta_1$ and/or $\gamma_j - \gamma_1$ is statistically different from zero. This is determined by checking the simultaneous 95% confidence intervals which are constructed for each of these differences. Each true difference can be stated to lie within its respective confidence interval with 95% confidence. If zero is contained within the confidence interval, then there is no evidence that the corresponding difference is significantly different from zero.

If at least one of the confidence intervals for the differences $\ln \beta_j - \ln \beta_1$ or $\gamma_j - \gamma_1$ fails to include zero, then the statistical significance of the effect due to water types has been established. However, establishment of a statistically significant effect due to water type does not necessarily mean that the effect is of practical importance. Practical importance is related to the size and interpretation of the difference.

The interpretation of the differences involves comparing the mean recovery and standard deviation of the (X_{ijk}) data for each water type to the mean recovery and standard deviation obtained for distilled water. These comparisons are made on a relative basis. The mean recovery for water type j is given by Equation (11). The mean recovery for water type j is compared to that for distilled water ($j=1$) on a relative basis by

$$\frac{E(X_{ijk})}{E(X_{i1k})} = \frac{\beta_j C_k^{\gamma_j} E(L_i \cdot \epsilon_{ijk})}{\beta_1 C_k^{\gamma_1} E(L_i \cdot \epsilon_{i1k})} = \frac{\beta_j}{\beta_1} C_k^{\gamma_j - \gamma_1} \quad (14)$$

BEGIN
LAST LINE
OF TEXT

3/8"

24

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

(The ratio of the standard deviations would be equivalent to Equation (14) and therefore the interpretation of the effect on precision is the same as that for the effect on mean recovery.)

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

The ratio in Equation (14) is a measure of the relative difference in mean recovery between water type j and distilled water. It is composed of two parts (a) β_j/β_1 , which is independent of the true concentration level (i.e. the constant bias), and (b) $C_k \gamma_j - \gamma_1$ which depends upon the true concentration level (i.e. the concentration dependent bias). If $\gamma_j - \gamma_1$ is zero, then the relative difference in mean recovery is just β_j/β_1 which is independent of concentration level C_k . Therefore, it can then be stated that the mean recovery of water type j is $(\beta_j/\beta_1) \times 100\%$ of the mean recovery for distilled water. If $\gamma_j - \gamma_1$ is not zero, then the mean recovery of water type j is $(\beta_j/\beta_1) \cdot (C_k \gamma_j - \gamma_1) \times 100\%$ of that for distilled water, and therefore depends upon the true concentration level C_k .

In order to illustrate these points consider the following example. Suppose that a significant F-value has been obtained, and the confidence intervals for all the differences contain zero except for water type 5. For water type 5, the point estimate for $\ln \beta_5 - \ln \beta_1$ is 0.38 and the confidence interval for $\ln \beta_5 - \ln \beta_1$ is (-0.69, -0.07). The point estimate for $\gamma_5 - \gamma_1$ is 0.07, and the confidence interval for $\gamma_5 - \gamma_1$ is (-0.04, 0.18). In this case a statistically significant effect due to water type has been established which involves only water type 5. The practical significance of this effect is judged by considering Equation (14). The ratio of mean recoveries for water type 5 and distilled water is given by

$$\frac{E(X_{i5k})}{E(X_{i1k})} = \frac{\beta_5}{\beta_1} C_k \gamma_5 - \gamma_1, \quad (15)$$

and the ratio of the standard deviations is given by

$$\sqrt{\frac{\text{Var}(X_{i5k})}{\text{Var}(X_{i1k})}} = \frac{\beta_5}{\beta_1} C_k \gamma_5 - \gamma_1 \quad (16)$$

Since the confidence interval for $\gamma_5 - \gamma_1$ contains zero this difference is assumed to be insignificant and is set to zero. Therefore Equations (15) and (16) reduce to β_5/β_1 . The point estimate for $\ln \beta_5 - \ln \beta_1$ was -0.38. Therefore the point estimate for β_5/β_1 is 0.68 and the mean recovery for water type 5, then the mean recovery for distilled water is estimated to be 68%. Similarly the standard deviation for the data for water type 5 is estimated to be 68% of the standard deviation for distilled water. Since the 95% confidence interval for $\ln \beta_5 - \ln \beta_1$ was (-0.69, -0.07), any value in the interval (0.50, 0.93) is a reasonable estimate for β_5/β_1 , and the mean recovery (standard deviation) for water type 5 can be claimed to be from 50% to 93% of the mean recovery (standard deviation) for distilled water. The practical significance of the effect due to water type 5 would depend upon the importance of a mean recovery (standard deviation) which is between 50 and 93% of the mean recovery (standard deviation) observed for distilled water.

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

The comparison of accuracy and precision across water types just discussed is based on the assumption that Equation (10) approximately models the data. It is clear that in practical monitoring programs of this type such models cannot model the data completely in every case. This analysis therefore is viewed as a screening procedure which identifies those cases where differences in water types are likely to be present. A more detailed, local analysis can then be pursued using the basic summary statistics for precision and accuracy.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

8-1/2"

9-1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

26

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

EPA Form 2350-4 (4-80)

(PREVIOUSLY C/N EPA FORM 287)

PAGE NUMBER

U.S. GOVERNMENT PRINTING OFFICE: 1980-24-2004

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

SECTION 4

RESULTS AND DISCUSSION

The purpose of this study was to determine the precision and accuracy of Method 604-Phenols for the compounds of concern using a large group of representative laboratories. This interlaboratory study was therefore a realistic evaluation of the method's performance. In reviewing the data developed the overall data statistically fall in the ranges anticipated based on IT Enviroscience's intralaboratory study of the method. However, caution must be exercised in the review and interpretation of the general observations and conclusions presented in this section. The large amount of data involved in the study dictates that there are always exceptions to each conclusion in at least one concentration, compound, or water type.

As part of the interlaboratory study the participating laboratories were to collect and use in the study samples from a local surface water, laboratory distilled/deionized water, and a finished drinking water. Upon reviewing the initial results from the laboratories it was noticed that the recoveries of phenols in the tap water samples were low. This observation led to the conclusion that the tap water had not been dechlorinated as outlined in the EPA Method 604-Phenols in Section 8.0 "Sample Collection, Preservation and Handling." At that point all of the participating laboratories were contacted to determine if they had dechlorinated the water. Seventeen of the twenty laboratories had not dechlorinated the water or determined the absence of chlorine prior to sample extraction and subsequent analysis. Since the laboratories were all near completion in the analysis, the data on the nondechlorinated tap water was collected and incorporated in this study. Due to a limit of funds, not all of the laboratories were asked to reanalyze the tap water (dechlorinated); however, four laboratories were selected and their data were combined with the three laboratories that had used dechlorinated tap water.

STATISTICAL SUMMARIES

The basic summary statistics discussed in Section 3 were calculated for each of the eleven phenols by the flame ionization procedure and nine of the phenols by the electron capture procedure. These statistics are summarized in Tables 6 through 25. The number of outliers for each data set analyzed by the flame ionization procedure as determined by ranking and individual outlier test ranged from one to ten, and averaged about four outliers per data set. For all data for the eleven phenols, analyzed by the flame ionization procedure, 20% of the data was rejected. Based on the concentration and water type for the specific compounds, the greatest percentage (24%) of outliers was obtained for phenol and the lowest percentage of outliers (17%) for 2,4-dichlorophenol. The number of outliers for each data set analyzed

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

TABLE 6.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOL/SIFID

STATISTICAL SUMMARY FOR PHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	16	16	11	12	15	14	16	16	16	16	15	15
TRUE VALUE UG/L	20.40	18.40	20.40	18.40	20.40	18.40	20.40	18.40	20.40	18.40	20.40	18.40
MEAN RECOVERY	8.94	8.16	4.10	6.82	8.58	7.48	9.72	8.45	10.09	9.56	8.65	7.59
ACCURACY AS % REL ERROR	-56.20	-59.69	-40.29	-73.83	-57.95	-59.37	-52.37	-54.09	-50.53	-48.06	-57.59	-58.74
OVERALL STD DEV (S)	2.12	2.27	3.22	2.71	2.39	1.25	3.17	3.01	3.18	3.52	2.37	2.44
OVERALL REL STD DEV, %	23.68	27.81	39.70	56.34	27.90	16.74	32.59	35.62	31.51	36.78	27.34	32.08
SINGLE STD DEV, (SR)	.75	2.29			1.35		2.53		1.46		1.62	
ANALYST REL DEV, %	8.77	35.46			16.76		27.86		14.88		19.99	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	15	13	12	15	13	17	16	17	16	15	15
TRUE VALUE UG/L	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20
MEAN RECOVERY	40.03	41.59	26.40	21.32	40.57	38.72	39.62	43.35	41.41	42.25	41.28	36.61
ACCURACY AS % REL ERROR	-60.37	-54.40	-73.46	-76.43	-59.83	-57.54	-60.77	-52.47	-59.00	-53.67	-58.13	-58.85
OVERALL STD DEV (S)	11.57	6.88	16.84	13.52	10.41	6.51	12.65	17.03	14.51	9.64	16.82	10.50
OVERALL REL STD DEV, %	28.90	16.54	63.64	63.44	25.67	16.82	31.92	35.29	33.04	22.82	40.75	28.67
SINGLE STD DEV, (SR)	10.50	7.19			7.58		13.90		9.41		5.44	
ANALYST REL DEV, %	25.95	30.13			16.12		33.51		22.51		13.98	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	14	14	12	13	15	13	16	16	17	17	15	14
TRUE VALUE UG/L	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00
MEAN RECOVERY	114.33	98.96	71.80	78.52	113.45	89.77	126.45	106.67	107.60	96.42	100.02	93.58
ACCURACY AS % REL ERROR	-54.63	-56.44	-71.51	-65.56	-54.98	-60.63	-49.82	-53.22	-57.30	-57.71	-60.31	-58.96
OVERALL STD DEV (S)	23.60	9.21	34.58	51.15	38.14	9.83	40.79	40.71	30.94	26.18	28.15	13.21
OVERALL REL STD DEV, %	20.64	9.11	53.74	65.14	33.62	10.95	32.25	38.16	28.76	27.15	28.14	14.12
SINGLE STD DEV, (SR)	13.32	20.47			18.83		25.84		24.61		18.95	
ANALYST REL DEV, %	12.49	27.23			16.93		22.17		24.13		19.58	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 6. (CONTINUED)

I M V S: PAGE 23

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS-FID

STATISTICAL SUMMARY FOR PHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 20.40 19.40
MEAN RECOVERY 6.40 7.49
ACCURACY AS % REL ERROR -68.64 -59.32
OVERALL STD DEV (S) 2.26 1.11
OVERALL REL STD DEV, % 35.36 16.79
SINGLE STD DEV, (SR) 1.07
ANALYST REL DEV, % 15.42

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 101.00 91.20
MEAN RECOVERY 35.65 44.11
ACCURACY AS % REL ERROR -64.70 -51.63
OVERALL STD DEV (S) 4.46 19.55
OVERALL REL STD DEV, % 12.52 22.06
SINGLE STD DEV, (SR) 13.71
ANALYST REL DEV, % 34.37

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 5
TRUE VALUE UG/L 252.00 229.00
MEAN RECOVERY 113.59 99.36
ACCURACY AS % REL ERROR -54.93 -56.62
OVERALL STD DEV (S) 50.64 45.99
OVERALL REL STD DEV, % 44.58 46.19
SINGLE STD DEV, (SR) 14.85
ANALYST REL DEV, % 13.95

WATER LEGEND

7 - TAP WATER - DC

TABLE 7.

I M V S: PAGE 72

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-17 ENV PHENOLSFID

STATISTICAL SUMMARY FOR 2,4-DIMETHYLPHENOL ANALYSES BY WATER TYPE

	WATER 1			WATER 2			WATER 3			WATER 4			WATER 5			WATER 6		
LOW YOUNG PAIR	1	2		1	2		1	2		1	2		1	2		1	2	
NUMBER OF DATA POINTS	15	15		12	10		14	17		16	17		16	16		17	18	
TRUE VALUE UG/L	13.00	15.20		13.00	15.20		13.00	15.20		13.00	15.20		13.00	15.20		13.00	15.20	
MEAN RECOVERY	6.72	7.41		3.63	2.07		5.74	6.84		4.83	5.94		4.92	5.82		5.26	5.28	
ACCURACY AS % REL ERROR	-48.32	-51.28		-72.03	-86.40		-55.83	-55.03		-62.81	-60.91		-61.16	-61.72		-57.21	-65.23	
OVERALL STD DEV (S)	2.18	2.45		1.98	1.96		2.23	2.57		2.54	2.93		1.59	2.35		2.83	2.33	
OVERALL REL STD DEV, %	32.51	33.10		54.58	95.00		39.23	37.65		52.53	84.65		32.38	40.39		50.80	44.06	
SINGLE STD DEV, (SR)	1.17	1.37		1.38	1.38		1.38	1.38		2.44	2.44		1.56	1.56		1.64	1.64	
ANALYST REL DEV, %	16.58	48.00		21.98	21.98		21.98	21.98		45.26	45.26		29.00	29.00		30.30	30.30	
MEDIUM YOUNG PAIR	3	5		3	5		3	5		3	5		3	5		3	5	
NUMBER OF DATA POINTS	16	14		10	11		17	16		16	16		17	15		17	18	
TRUE VALUE UG/L	30.40	37.60		30.40	37.60		30.40	37.60		30.40	37.60		30.40	37.60		30.40	37.60	
MEAN RECOVERY	15.91	22.43		12.31	10.20		14.38	19.35		12.40	12.21		11.41	14.41		13.65	18.26	
ACCURACY AS % REL ERROR	-47.68	-40.38		-59.50	-72.87		-52.70	-48.53		-59.20	-48.92		-61.48	-61.48		-55.11	-51.44	
OVERALL STD DEV (S)	4.75	4.88		10.67	7.42		5.92	6.36		6.22	8.36		4.77	7.11		8.37	15.92	
OVERALL REL STD DEV, %	29.87	21.78		86.54	72.74		37.70	32.87		50.14	43.52		41.82	49.38		61.31	87.21	
SINGLE STD DEV, (SR)	5.29	8.79		3.15	3.15		3.15	3.15		5.05	5.05		3.93	3.93		10.98	10.98	
ANALYST REL DEV, %	27.58	78.12		18.69	18.69		18.69	18.69		31.98	31.98		30.47	30.47		68.86	68.86	
HIGH YOUNG PAIR	4	6		4	6		4	6		4	6		4	6		4	6	
NUMBER OF DATA POINTS	15	15		13	14		17	17		17	16		18	17		18	17	
TRUE VALUE UG/L	122.00	151.00		122.00	151.00		122.00	151.00		122.00	151.00		122.00	151.00		122.00	151.00	
MEAN RECOVERY	75.45	91.03		56.93	52.25		66.93	79.21		60.01	75.54		50.95	64.77		48.13	75.64	
ACCURACY AS % REL ERROR	-38.16	-39.71		-69.73	-65.40		-45.14	-47.54		-50.81	-49.98		-58.24	-57.10		-60.55	-49.91	
OVERALL STD DEV (S)	13.51	34.06		27.77	42.74		16.40	29.76		25.28	28.69		21.93	28.64		28.88	31.05	
OVERALL REL STD DEV, %	11.91	37.42		75.20	81.80		24.50	37.58		42.12	39.30		43.08	44.21		60.00	41.05	
SINGLE STD DEV, (SR)	22.68	23.69		19.09	19.09		19.09	19.09		16.80	16.80		10.77	10.77		25.54	25.54	
ANALYST REL DEV, %	27.24	53.13		26.13	26.13		26.13	26.13		24.79	24.79		18.62	18.62		41.27	41.27	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 7. (CONTINUED)

I M V 51 PAGE 73

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
STATISTICAL SUMMARY FOR 2,4-DIMETHYLPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 13.00 15.20
MEAN RECOVERY 4.72 4.65
ACCURACY AS % REL ERROR -63.69 -62.94
OVERALL STD DEV (S) 1.91 2.19
OVERALL REL STD DEV, % 40.45 39.77
SINGLE STD DEV, (SR) 1.43
ANALYST REL DEV, % 27.62

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 30.40 37.50
MEAN RECOVERY 15.42 25.72
ACCURACY AS % REL ERROR -49.29 -28.95
OVERALL STD DEV (S) 3.05 11.26
OVERALL REL STD DEV, % 19.77 49.15
SINGLE STD DEV, (SR) 7.37
ANALYST REL DEV, % 34.98

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 122.00 151.00
MEAN RECOVERY 70.10 80.47
ACCURACY AS % REL ERROR -42.54 -46.71
OVERALL STD DEV (S) 20.20 32.36
OVERALL REL STD DEV, % 29.82 40.22
SINGLE STD DEV, (SR) 25.14
ANALYST REL DEV, % 33.40

WATER LEGEND.

7 - TAP WATER - 0C

TABLE 8.

I M V SI PAGE 122

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
STATISTICAL SUMMARY FOR 2-CHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	17	16	13	13	16	15	16	17	15	15	15	16
TRUE VALUE UG/L	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20
MEAN RECOVERY	11.48	8.91	10.89	9.37	12.18	9.37	12.32	11.40	10.74	11.09	11.09	12.02
ACCURACY AS % REL ERROR	-21.38	-26.97	-25.42	-21.58	-16.51	-23.19	-15.64	-6.58	-26.44	-24.38	-24.06	-14.45
OVERALL STD DEV (SI)	3.28	2.24	4.76	4.47	2.40	2.04	4.52	5.54	3.41	2.58	3.71	7.31
OVERALL REL STD DEV, %	20.55	25.18	43.74	46.77	19.68	21.82	36.71	48.65	31.73	27.92	33.47	60.80
SINGLE STD DEV, (SR)	1.74	3.08	3.08	2.04	2.04	3.17	3.17	4.71	1.27	4.71	4.71	40.78
ANALYST REL DEV, %	17.07	30.15	30.15	18.94	18.94	26.71	26.71	40.78	12.76	40.78	40.78	40.78
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	19	17	14	15	17	15	17	15	18	15	17	15
TRUE VALUE UG/L	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40
MEAN RECOVERY	27.70	26.50	41.89	41.80	32.53	26.36	28.11	27.32	26.93	23.91	26.32	23.47
ACCURACY AS % REL ERROR	-25.13	-12.83	13.21	37.51	-12.03	-13.89	-24.02	-10.13	-27.23	-21.34	-34.26	-27.79
OVERALL STD DEV (SI)	10.69	5.22	27.82	18.31	12.82	5.36	11.24	7.33	12.39	5.51	10.64	4.10
OVERALL REL STD DEV, %	38.61	19.70	66.42	43.79	37.55	20.32	39.37	26.83	46.02	23.06	43.76	17.48
SINGLE STD DEV, (SR)	7.38	20.69	20.69	6.37	6.37	8.85	8.85	6.69	8.16	6.69	6.69	28.00
ANALYST REL DEV, %	27.22	49.45	49.45	21.64	21.64	31.94	31.94	28.00	32.11	28.00	28.00	28.00
HIGH YOUNG PAIR	4	5	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	19	19	16	16	16	16	17	16	18	16	16	16
TRUE VALUE UG/L	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00
MEAN RECOVERY	152.48	122.14	153.93	149.39	147.96	119.13	157.01	127.78	134.96	105.20	141.83	120.08
ACCURACY AS % REL ERROR	-17.58	-19.64	-16.40	-1.72	-20.02	-21.82	-15.13	-15.93	-27.05	-30.79	-23.33	-21.00
OVERALL STD DEV (SI)	26.70	23.24	71.97	50.12	42.44	26.05	37.46	20.07	32.23	20.03	37.58	24.67
OVERALL REL STD DEV, %	17.51	16.57	46.76	33.55	29.68	22.37	23.86	15.71	23.88	19.04	26.49	20.55
SINGLE STD DEV, (SR)	16.83	50.63	50.63	26.99	26.99	21.92	21.92	21.83	16.23	21.83	21.83	16.67
ANALYST REL DEV, %	12.26	33.39	33.39	20.21	20.21	15.39	15.39	16.67	13.52	16.67	16.67	16.67

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 8. (CONTINUED)

I M V S: PAGE 123

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-17 ENV PHENOLS/FID

STATISTICAL SUMMARY FOR 2-CHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR 1 2
NUMBER OF DATA POINTS 6 5
TRUE VALUE UG/L 14.60 12.20
MEAN RECOVERY 8.05 8.35
ACCURACY AS % REL ERROR -44.89 -31.46
OVERALL STD DEV (S) 3.08 1.17
OVERALL REL STD DEV, % 39.28 14.02

SINGLE STD DEV, (SR) 1.96
ANALYST REL DEV, % 23.89

MEDIUM YOUNG PAIR 3 4
NUMBER OF DATA POINTS 6 6
TRUE VALUE UG/L 37.00 30.40
MEAN RECOVERY 23.97 24.18
ACCURACY AS % REL ERROR -35.23 -20.43
OVERALL STD DEV (S) 4.87 3.91
OVERALL REL STD DEV, % 20.31 14.52

SINGLE STD DEV, (SR) 2.45
ANALYST REL DEV, % 10.19

HIGH YOUNG PAIR 4 5
NUMBER OF DATA POINTS 6 6
TRUE VALUE UG/L 185.00 152.00
MEAN RECOVERY 131.55 105.87
ACCURACY AS % REL ERROR -28.89 -30.35
OVERALL STD DEV (S) 49.20 23.76
OVERALL REL STD DEV, % 37.40 22.45

SINGLE STD DEV, (SR) 30.75
ANALYST REL DEV, % 25.90

WATER LEGEND

7 - TAP WATER - DC

TABLE 9.

I M V S: PAGE 172

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSDIFID

STATISTICAL SUMMARY FOR 4-CHLORO-3-METHYLPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	16	16	13	11	15	16	16	17	15	15	16	16
TRUE VALUE UG/L	30.00	30.00	30.00	30.00	30.00	36.00	30.00	36.00	30.00	36.00	30.00	36.00
MEAN RECOVERY	29.27	27.14	19.47	18.68	22.40	29.60	21.02	30.02	22.52	27.54	19.59	24.78
ACCURACY AS % REL ERROR	-19.78	-24.60	-37.77	-59.21	-25.33	-17.22	-29.94	-16.61	-24.94	-23.91	-34.72	-31.16
OVERALL STD DEV (S)	5.32	5.20	10.85	2.70	7.04	11.11	7.46	14.13	9.91	10.23	8.15	6.47
OVERALL REL STD DEV, %	21.05	22.93	36.12	52.47	31.40	37.28	35.48	47.08	42.25	38.23	41.63	26.10
SINGLE STD DEV, (SR)	2.77		6.60		5.47		10.24		5.91		4.95	
ANALYST REL DEV, %	10.56		39.57		20.94		40.13		23.63		22.33	
MEDIUM YOUNG PAIR	3	5	13	13	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	16	16	13	13	16	15	16	16	15	16	15	16
TRUE VALUE UG/L	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00
MEAN RECOVERY	130.94	159.76	66.53	79.23	119.49	99.39	150.14	119.10	159.95	158.53	136.46	136.46
ACCURACY AS % REL ERROR	-12.71	-11.80	-55.65	-55.98	-20.34	-15.19	-33.74	-16.59	-20.60	-16.59	-27.98	-24.19
OVERALL STD DEV (S)	16.63	17.04	42.97	44.39	30.43	30.61	31.53	63.30	23.48	43.35	39.97	30.66
OVERALL REL STD DEV, %	12.70	10.73	49.56	56.02	25.51	20.05	31.72	42.16	19.72	28.91	36.00	22.47
SINGLE STD DEV, (SR)	15.81		25.06		21.32		51.53		33.65		21.55	
ANALYST REL DEV, %	10.92		34.39		15.67		41.30		25.02		17.58	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	17	14	12	13	15	15	17	17	17	17	16	16
TRUE VALUE UG/L	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00
MEAN RECOVERY	321.37	378.79	209.00	275.18	298.86	359.28	341.26	356.11	292.86	364.15	291.28	351.66
ACCURACY AS % REL ERROR	-14.07	-16.71	-44.12	-38.85	-20.09	-20.16	-8.75	-20.88	-21.59	-19.08	-22.12	-21.85
OVERALL STD DEV (S)	60.96	85.14	45.72	135.13	92.35	78.99	115.66	168.35	76.94	196.27	89.08	124.49
OVERALL REL STD DEV, %	18.97	22.72	40.78	49.11	30.90	21.99	33.89	47.27	26.27	53.90	30.56	35.40
SINGLE STD DEV, (SR)	39.98		75.98		56.80		92.98		126.27		58.02	
ANALYST REL DEV, %	11.49		31.38		17.67		26.67		36.44		18.05	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 9. (CONTINUED)

I M V S: PAGE 173

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:PID

STATISTICAL SUMMARY FOR 4-CHLORO-3-METHYLPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 30.00 36.00
MEAN RECOVERY 18.44 26.34
ACCURACY AS % REL ERROR -38.32 -26.72
OVERALL STD DEV (S) 6.16 2.07
OVERALL REL STD DEV, % 33.39 11.26
SINGLE STD DEV, (SR) 4.04
ANALYST REL DEV, % 18.02

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 150.00 180.00
MEAN RECOVERY 108.08 152.40
ACCURACY AS % REL ERROR -27.95 -15.33
OVERALL STD DEV (S) 14.85 16.82
OVERALL REL STD DEV, % 13.74 11.03
SINGLE STD DEV, (SR) 12.14
ANALYST REL DEV, % 9.32

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 374.00 450.00
MEAN RECOVERY 290.20 337.20
ACCURACY AS % REL ERROR -22.41 -20.62
OVERALL STD DEV (S) 69.41 76.74
OVERALL REL STD DEV, % 23.92 21.48
SINGLE STD DEV, (SR) 63.22
ANALYST REL DEV, % 19.53

WATER LEGEND

7 - TAP WATER - DC

TABLE 10.

I M V S: PAGE 222

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD30 VALIDATION STUDY-IT ENV PHENOLISIFID

STATISTICAL SUMMARY FOR 2,4-DICHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	17	17	12	14	17	17	18	17	18	17	16	16
TRUE VALUE UG/L	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00
MEAN RECOVERY	12.57	14.18	11.60	12.72	12.17	14.28	12.61	14.38	10.09	13.46	12.67	14.87
ACCURACY AS % REL ERROR	-14.42	-14.60	-21.61	-25.21	-17.76	-16.03	-14.77	-15.40	-31.83	-20.82	-14.38	-12.55
OVERALL STD DEV (S)	3.32	2.50	1.50	2.30	2.75	3.14	4.49	5.42	3.68	4.61	3.54	4.63
OVERALL REL STD DEV, %	26.21	17.36	13.76	18.03	22.62	21.99	35.56	37.70	36.46	34.21	27.93	31.58
SINGLE STD DEV, (SR)	2.21	1.33	1.08	1.63	1.63	1.63	3.82	2.74	2.74	2.74	2.09	2.09
ANALYST REL DEV, %	16.45	10.92	10.92	12.35	12.35	12.35	28.28	23.29	23.29	23.29	15.16	15.16
MEDIUM YOUNG PAIR	3	5	1	3	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	17	17	14	14	18	16	17	19	18	17	16	16
TRUE VALUE UG/L	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00
MEAN RECOVERY	92.02	113.94	67.46	104.92	93.92	102.28	73.79	105.24	73.18	95.08	69.19	96.30
ACCURACY AS % REL ERROR	-26.77	-14.00	-39.77	-18.67	-25.07	-25.71	-34.12	-18.42	-34.66	-26.29	-38.22	-25.35
OVERALL STD DEV (S)	29.11	14.84	29.42	19.77	31.77	12.26	24.54	4.84	29.47	24.07	29.04	15.65
OVERALL REL STD DEV, %	35.50	12.06	30.12	18.84	37.85	11.99	33.25	42.61	40.28	25.32	41.97	16.25
SINGLE STD DEV, (SR)	22.47	18.08	18.08	15.58	15.58	15.58	35.09	29.97	29.97	29.97	26.95	26.95
ANALYST REL DEV, %	23.20	20.98	20.98	16.74	16.74	16.74	39.20	35.83	35.83	35.83	32.56	32.56
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	16	16	14	14	18	16	17	18	18	19	17	17
TRUE VALUE UG/L	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00
MEAN RECOVERY	158.74	175.14	141.50	181.51	168.78	177.11	159.66	163.86	141.97	159.41	151.44	170.61
ACCURACY AS % REL ERROR	-14.65	-18.16	-24.92	-15.18	-9.26	-19.57	-15.16	-23.43	-23.57	-25.51	-18.58	-20.28
OVERALL STD DEV (S)	23.92	23.91	34.76	30.42	61.26	41.25	31.04	54.73	23.00	41.11	39.49	33.88
OVERALL REL STD DEV, %	15.07	13.63	24.56	16.76	36.30	23.97	16.44	33.40	16.20	25.79	26.08	19.86
SINGLE STD DEV, (SR)	18.46	38.03	38.03	27.88	27.88	27.88	38.07	38.07	27.12	27.12	27.85	27.85
ANALYST REL DEV, %	11.06	23.55	23.55	16.36	16.36	16.36	23.53	23.53	17.99	17.99	17.30	17.30

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE 10. (CONTINUED)

I M V S: PAGE 223

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSFID

STATISTICAL SUMMARY FOR 2,4-DICHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 14.80 17.00
MEAN RECOVERY 11.15 13.83
ACCURACY AS % REL ERROR -24.65 -18.63
OVERALL STD DEV (S) 1.28 1.23
OVERALL REL STD DEV, % 11.48 5.87

SINGLE STD DEV, (SR) 1.30
ANALYST REL DEV, % 10.44

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 112.00 129.00
MEAN RECOVERY 83.58 93.95
ACCURACY AS % REL ERROR -25.37 -27.17
OVERALL STD DEV (S) 14.32 24.28
OVERALL REL STD DEV, % 17.14 30.10

SINGLE STD DEV, (SR) 22.28
ANALYST REL DEV, % 25.09

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 186.00 214.00
MEAN RECOVERY 153.17 169.50
ACCURACY AS % REL ERROR -17.55 -20.79
OVERALL STD DEV (S) 24.73 34.10
OVERALL REL STD DEV, % 16.15 20.12

SINGLE STD DEV, (SR) 32.44
ANALYST REL DEV, % 20.11

WATER LEGEND

7 - TAP WATER - DC

TABLE 11.

I M V 5: PAGE 272

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:PID

STATISTICAL SUMMARY FOR 2,4,6-TRICHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	16	14	14	15	15	17	17	16	19	16	17
TRUE VALUE UG/L	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60
MEAN RECOVERY	17.93	19.72	19.16	22.35	17.27	20.08	21.12	21.88	19.54	37.61	17.41	20.81
ACCURACY AS % REL ERROR	-12.13	-23.69	-6.07	-5.30	-15.36	-14.90	3.53	-7.29	-4.21	59.35	-14.64	-11.81
OVERALL STD DEV (S)	5.01	4.45	4.70	7.19	5.29	5.31	10.06	9.63	6.65	18.33	4.59	5.02
OVERALL REL STD DEV, %	27.92	23.76	24.53	32.13	30.40	26.42	47.64	44.02	34.04	101.44	26.33	24.12
SINGLE STD DEV, (SR)	2.36	4.40	4.40	21.21	2.59	13.88	5.65	26.26	14.25	49.67	2.38	12.45
ANALYST	12.87	21.21	21.21	21.21	13.88	13.88	26.26	26.26	49.67	49.67	12.45	12.45
MEDIUM YOUNG PAIR	3	5	1	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	16	14	13	15	15	17	16	16	17	16	16
TRUE VALUE UG/L	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00
MEAN RECOVERY	40.19	52.63	47.92	62.18	42.14	53.92	46.47	58.28	43.27	57.21	39.87	48.69
ACCURACY AS % REL ERROR	-19.95	-10.79	-5.35	5.34	-16.05	-8.62	-7.44	-1.22	-13.80	-3.03	-20.57	-17.47
OVERALL STD DEV (S)	9.48	4.82	14.44	13.49	8.49	16.15	14.80	15.72	16.70	20.36	11.31	9.30
OVERALL REL STD DEV, %	23.59	9.16	32.50	21.70	20.14	29.95	31.85	26.97	38.60	35.59	28.36	19.09
SINGLE STD DEV, (SR)	6.02	11.40	11.40	20.78	8.01	16.57	13.24	25.28	9.45	18.80	5.85	13.22
ANALYST	12.96	20.78	20.78	20.78	16.57	16.57	25.28	25.28	18.80	18.80	13.22	13.22
HIGH YOUNG PAIR	4	16	14	14	4	15	4	17	4	17	4	16
NUMBER OF DATA POINTS	16	16	14	14	15	15	17	17	16	17	17	16
TRUE VALUE UG/L	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00
MEAN RECOVERY	173.04	200.21	166.46	216.38	172.07	187.32	178.54	179.59	166.07	183.32	167.70	195.15
ACCURACY AS % REL ERROR	-13.48	-15.17	-15.77	-7.46	-13.96	-20.63	-10.73	-25.77	-16.97	-22.32	-16.15	-17.31
OVERALL STD DEV (S)	27.70	29.60	54.20	35.16	49.02	38.32	41.43	69.44	43.83	47.12	30.90	44.37
OVERALL REL STD DEV, %	16.01	14.79	32.18	16.10	28.49	20.46	23.20	39.64	26.15	25.71	18.43	22.74
SINGLE STD DEV, (SR)	18.25	42.61	42.61	22.03	28.39	20.46	52.18	29.51	22.00	22.00	27.64	19.23
ANALYST	9.78	22.03	22.03	22.03	19.80	20.46	29.51	29.51	12.60	12.60	15.23	15.23

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NOM OC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 11. (CONTINUED)

I M V S: PAGE 273

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS/FIO

STATISTICAL SUMMARY FOR 2,4,6-TRICHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YODEN PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 20.40 23.60
MEAN RECOVERY 20.73 20.30
ACCURACY AS % REL ERROR 1.63 -13.98
OVERALL STD DEV (S) 12.21 6.07
OVERALL REL STD DEV, % 59.88 25.07
SINGLE STD DEV, (SR) 9.18
ANALYST REL DEV, % 44.76

MEDIUM YODEN PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 50.20 59.00
MEAN RECOVERY 41.09 61.15
ACCURACY AS % REL ERROR -18.16 3.64
OVERALL STD DEV (S) 10.16 17.09
OVERALL REL STD DEV, % 24.72 27.95
SINGLE STD DEV, (SR) 6.43
ANALYST REL DEV, % 12.57

HIGH YODEN PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 200.00 236.00
MEAN RECOVERY 178.67 187.33
ACCURACY AS % REL ERROR -10.67 -20.62
OVERALL STD DEV (S) 41.29 17.80
OVERALL REL STD DEV, % 23.11 9.50
SINGLE STD DEV, (SR) 38.63
ANALYST REL DEV, % 21.11

WATER LEGEND

7 - TAP WATER - DC

TABLE 12.

I M V S: PAGE 322

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSFID

STATISTICAL SUMMARY FOR PENTACHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	16	17	14	14	15	14	14	11	15	14	15	15
TRUE VALUE UG/L	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20
MEAN RECOVERY	17.21	15.10	14.89	14.88	17.34	16.65	43.65	49.10	20.58	16.79	13.51	17.03
ACCURACY AS % REL ERROR	-3.32	-6.77	-16.35	-8.14	-2.59	2.79	143.24	203.11	15.59	3.61	-24.12	5.11
OVERALL STD DEV (S)	2.59	5.32	4.37	5.99	6.03	5.87	39.28	37.34	6.89	3.69	4.90	9.91
OVERALL REL STD DEV, %	15.04	35.20	29.37	40.27	34.78	35.23	89.98	76.09	33.51	22.01	36.26	58.19
SINGLE STD DEV, (SRI)	2.82		2.82		5.50		33.40		4.11		6.93	
ANALYST REL DEV, %	17.45		18.94		32.36		72.01		22.02		45.40	

MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	19	19	15	14	16	15	17	19	18	17	16	18
TRUE VALUE UG/L	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00
MEAN RECOVERY	95.90	111.93	107.78	99.90	97.32	99.99	140.04	121.41	95.99	88.27	100.93	102.32
ACCURACY AS % REL ERROR	-28.96	-7.49	-20.17	-17.44	-27.76	-17.36	9.66	34	-25.93	-27.05	-25.24	-15.44
OVERALL STD DEV (S)	41.25	20.97	36.18	19.75	35.95	22.54	48.78	73.91	33.44	29.48	42.63	34.19
OVERALL REL STD DEV, %	43.01	18.74	33.57	19.77	36.76	22.54	32.95	60.88	38.44	33.39	42.23	33.41
SINGLE STD DEV, (SRI)	30.27		28.00		20.42		65.23		22.23		22.07	
ANALYST REL DEV, %	29.13		26.97		20.68		48.42		23.82		21.71	

HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	18	19	15	14	16	15	19	16	18	18	17	18
TRUE VALUE UG/L	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00
MEAN RECOVERY	197.13	170.27	177.37	192.87	188.70	157.32	216.69	166.70	175.91	157.31	177.32	176.69
ACCURACY AS % REL ERROR	-12.77	-15.71	-21.52	-9.67	-16.31	-22.12	4.12	-11.48	-22.16	-22.12	-21.54	-13.52
OVERALL STD DEV (S)	25.85	37.19	70.21	37.66	56.43	45.73	92.84	86.12	50.08	66.37	62.29	73.63
OVERALL REL STD DEV, %	13.11	21.84	30.96	20.59	30.96	22.64	42.85	43.46	28.47	42.19	35.13	42.15
SINGLE STD DEV, (SRI)	25.40		47.05		27.70		62.78		60.20		58.36	
ANALYST REL DEV, %	13.83		26.12		16.01		32.75		36.13		33.16	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 12. (CONTINUED)

I M V S: PAGE 323

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

STATISTICAL SUMMARY FOR PENTACHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7	

LOW YOUNDEN PAIR	
NUMBER OF DATA POINTS	1 2
TRUE VALUE UG/L	17.80 15.20
MEAN RECOVERY	12.07 15.40
ACCURACY AS % REL ERROR	-32.21 -4.94
OVERALL STD DEV (S)	.45 9.30
OVERALL REL STD DEV, %	3.74 34.43
SINGLE STD DEV, (SR)	1.03
ANALYST REL DEV, %	7.48

MEDIUM YOUNDEN PAIR	
NUMBER OF DATA POINTS	3 5
TRUE VALUE UG/L	139.00 121.00
MEAN RECOVERY	117.34 101.40
ACCURACY AS % REL ERROR	-13.08 -15.87
OVERALL STD DEV (S)	36.71 7.89
OVERALL REL STD DEV, %	31.29 7.76
SINGLE STD DEV, (SR)	22.90
ANALYST REL DEV, %	20.90

HIGH YOUNDEN PAIR	
NUMBER OF DATA POINTS	4 6
TRUE VALUE UG/L	226.00 202.00
MEAN RECOVERY	183.03 172.40
ACCURACY AS % REL ERROR	-19.03 -14.65
OVERALL STD DEV (S)	55.78 19.91
OVERALL REL STD DEV, %	30.48 11.55
SINGLE STD DEV, (SR)	36.26
ANALYST REL DEV, %	20.40

WATER LEGEND	
7 - YAP WATER - DC	

TABLE 13.

I M V S: PAGE 372

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

STATISTICAL SUMMARY FOR 2-NITROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	18	18	13	13	15	15	15	15	16	16	17	17
TRUE VALUE UG/L	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00
MEAN RECOVERY	19.96	22.85	21.75	23.35	21.08	26.73	20.67	23.41	22.21	25.68	21.39	24.13
ACCURACY AS % REL ERROR	-20.15	-23.94	-13.02	-22.15	-15.68	-10.90	-17.31	-21.96	-11.17	-13.40	-13.44	-19.58
OVERALL STD DEV (S)	6.44	5.88	4.52	4.00	4.05	5.16	4.52	4.21	9.31	8.96	7.79	6.42
OVERALL REL STD DEV, %	32.28	30.12	20.79	17.12	19.20	19.31	21.85	18.00	41.92	34.89	36.43	26.63
SINGLE STD DEV, (SR)	3.47	2.21	2.83	2.83	2.83	3.40	3.40	3.40	4.71	4.71	3.99	3.99
ANALYST REL DEV, %	16.23	11.15	11.82	11.82	11.82	15.41	15.41	15.41	19.67	19.67	17.92	17.92
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	18	17	13	14	17	16	15	14	17	16	17	16
TRUE VALUE UG/L	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00
MEAN RECOVERY	91.07	131.35	99.43	128.41	103.40	129.94	91.47	121.78	92.59	122.77	88.89	128.63
ACCURACY AS % REL ERROR	-26.56	-17.43	-19.73	-14.39	-16.62	-13.64	-26.23	-18.81	-25.33	-18.15	-28.32	-14.25
OVERALL STD DEV (S)	27.18	12.88	18.95	10.91	26.92	19.99	31.39	22.13	31.44	26.76	32.76	18.21
OVERALL REL STD DEV, %	29.84	9.51	19.04	8.50	25.94	15.43	34.31	18.17	33.96	21.79	36.86	14.15
SINGLE STD DEV, (SR)	22.19	13.63	18.05	13.63	18.05	15.43	29.17	18.17	31.69	26.32	26.32	14.15
ANALYST REL DEV, %	19.95	11.95	15.50	11.95	15.50	27.36	27.36	27.36	29.43	29.43	24.20	24.20
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	18	18	14	14	17	17	16	14	17	17	17	17
TRUE VALUE UG/L	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00
MEAN RECOVERY	253.65	298.73	232.05	300.84	263.92	299.31	255.18	306.96	246.07	296.29	236.59	288.29
ACCURACY AS % REL ERROR	-19.70	-20.13	-29.42	-19.56	-15.41	-19.97	-18.21	-17.92	-21.13	-23.45	-21.17	-22.92
OVERALL STD DEV (S)	32.90	41.91	65.43	79.09	73.95	63.36	61.34	29.59	28.10	66.42	56.71	59.61
OVERALL REL STD DEV, %	12.97	14.00	28.28	25.96	27.99	21.17	24.04	9.64	11.42	23.20	23.97	19.29
SINGLE STD DEV, (SR)	29.65	58.92	54.51	58.92	54.51	43.28	43.28	43.28	38.23	35.29	35.29	19.29
ANALYST REL DEV, %	10.74	22.11	19.36	22.11	19.36	15.40	15.40	15.40	14.36	13.45	13.45	13.45

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE 13. (CONTINUED)

I M V S: PAGE 373

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FIO

STATISTICAL SUMMARY FOR 2-NITROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR 1 2
NUMBER OF DATA POINTS 7 7
TRUE VALUE UG/L 25.00 30.00
MEAN RECOVERY 16.11 26.03
ACCURACY AS % REL ERROR -35.54 -15.90
OVERALL STD DEV (S) 5.12 5.73
OVERALL REL STD DEV, % 37.98 23.84
SINGLE STD DEV, (SR) 4.17
ANALYST REL DEV, % 20.78

MEDIUM YOUNG PAIR 3 4
NUMBER OF DATA POINTS 7 7
TRUE VALUE UG/L 124.00 150.00
MEAN RECOVERY 90.99 117.83
ACCURACY AS % REL ERROR -26.62 -21.49
OVERALL STD DEV (S) 20.18 22.21
OVERALL REL STD DEV, % 22.18 14.85
SINGLE STD DEV, (SR) 15.58
ANALYST REL DEV, % 14.92

HIGH YOUNG PAIR 4 6
NUMBER OF DATA POINTS 7 7
TRUE VALUE UG/L 312.00 374.00
MEAN RECOVERY 240.29 276.29
ACCURACY AS % REL ERROR -23.99 -26.13
OVERALL STD DEV (S) 65.67 68.74
OVERALL REL STD DEV, % 27.74 24.08
SINGLE STD DEV, (SR) 41.47
ANALYST REL DEV, % 16.06

WATER LEGEND

7 - TAP WATER - DC

TABLE 14.

I N V S I PAGE 422

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS/FIO

STATISTICAL SUMMARY FOR 4-NITROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	14	15	14	14	17	17	16	17	14	15	17	15
TRUE VALUE UG/L	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00
MEAN RECOVERY	14.29	13.18	15.03	14.13	16.68	16.24	14.55	16.39	12.03	13.03	14.91	14.49
ACCURACY AS % REL ERROR	-49.34	-58.81	-43.15	-55.85	-40.84	-49.24	-48.40	-48.78	-57.28	-53.05	-47.13	-54.71
OVERALL STD DEV (S)	8.01	4.64	4.50	5.35	10.52	6.93	7.28	9.42	6.14	4.75	8.68	6.94
OVERALL REL STD DEV, %	56.04	50.68	28.04	37.89	62.47	42.67	50.00	57.49	50.95	31.61	58.22	47.90
SINGLE STD DEV, (SW)	4.72		4.76		9.05		3.76		3.06		3.51	
ANALYST REL DEV, %	34.37		31.54		54.97		24.31		22.62		23.88	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	16	15	15	18	18	19	20	17	16	17	17
TRUE VALUE UG/L	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00
MEAN RECOVERY	92.91	117.74	91.75	93.42	85.14	101.46	84.97	101.50	82.05	86.41	78.55	108.08
ACCURACY AS % REL ERROR	-59.76	-50.94	-56.95	-61.08	-59.66	-57.73	-59.54	-57.71	-60.93	-63.99	-62.12	-54.97
OVERALL STD DEV (S)	35.08	21.10	70.21	32.67	27.29	43.68	28.87	45.27	38.85	35.58	35.71	40.74
OVERALL REL STD DEV, %	37.76	17.92	22.14	34.98	32.05	43.06	33.98	44.60	42.47	41.17	44.89	37.70
SINGLE STD DEV, (SW)	27.37		24.69		27.25		35.45		24.86		31.50	
ANALYST REL DEV, %	25.99		26.73		29.21		38.03		29.52		33.58	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	14	13	13	14	16	15	19	16	16	17	15	16
TRUE VALUE UG/L	260.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00
MEAN RECOVERY	132.46	137.91	116.36	134.36	123.94	127.34	129.25	132.60	95.62	116.71	110.56	125.16
ACCURACY AS % REL ERROR	-52.69	-55.90	-48.44	-59.01	-55.73	-60.21	-53.84	-58.56	-63.85	-63.53	-60.51	-60.89
OVERALL STD DEV (S)	28.43	19.04	33.74	32.27	57.98	22.14	45.71	41.93	41.30	38.26	33.89	26.75
OVERALL REL STD DEV, %	21.46	13.40	28.65	38.90	46.70	17.38	35.36	31.62	43.19	32.78	30.66	21.37
SINGLE STD DEV, (SW)	16.38		32.57		35.87		35.97		19.39		20.81	
ANALYST REL DEV, %	12.12		25.98		28.55		27.47		18.27		17.66	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - MON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 14. (CONTINUED)

I M V S: PAGE 423

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSF10

STATISTICAL SUMMARY FOR 4-NITROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 7
TRUE VALUE UG/L 28.20 32.00
MEAN RECOVERY 14.83 18.56
ACCURACY AS % REL ERROR -47.53 -41.70
OVERALL STD DEV (S) 10.15 8.48
OVERALL REL STD DEV, % 68.68 45.45
SINGLE STD DEV, (SR) 7.69
ANALYST REL DEV, % 45.95

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 210.00 240.00
MEAN RECOVERY 77.00 93.90
ACCURACY AS % REL ERROR -63.33 -60.88
OVERALL STD DEV (S) 26.69 14.32
OVERALL REL STD DEV, % 34.57 15.25
SINGLE STD DEV, (SR) 13.20
ANALYST REL DEV, % 15.44

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 280.00 320.00
MEAN RECOVERY 145.57 118.42
ACCURACY AS % REL ERROR -48.01 -62.87
OVERALL STD DEV (S) 59.60 27.34
OVERALL REL STD DEV, % 40.26 23.01
SINGLE STD DEV, (SR) 45.39
ANALYST REL DEV, % 34.34

WATER LEGEND

7 - TAP WATER - DC

TABLE 15.

I N V 51 PAGE 472

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

STATISTICAL SUMMARY FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	16	15	15	14	15	16	15	15	16	15	16
TRUE VALUE UG/L	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60
MEAN RECOVERY	25.45	25.08	25.79	26.58	26.71	28.60	25.11	30.30	30.09	33.39	26.25	30.36
ACCURACY AS % REL ERROR	-15.60	-25.36	-13.45	-20.89	-10.38	-14.89	-15.75	-9.82	-9.99	-3.61	-11.90	-9.64
OVERALL STD DEV (S)	10.99	10.01	5.86	5.61	7.91	5.13	12.03	16.78	7.29	7.83	7.66	11.33
OVERALL REL STD DEV, %	43.18	30.93	25.44	21.11	29.62	17.93	47.91	59.39	24.24	24.17	29.19	37.30
SINGLE STD DEV, (SR)	4.95		2.77		4.17		4.21		4.22		7.36	
ANALYST REL DEV, %	19.59		10.36		15.07		15.20		13.51		25.99	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	17	16	16	15	18	17	17	15	18	16	16	17
TRUE VALUE UG/L	149.00	169.00	149.00	169.00	149.00	169.00	149.00	169.00	149.00	169.00	149.00	169.00
MEAN RECOVERY	118.79	140.28	118.20	141.66	119.78	140.63	131.40	158.88	122.14	158.85	128.31	151.65
ACCURACY AS % REL ERROR	-20.27	-11.67	-20.67	-16.18	-19.61	-16.79	-11.81	-5.99	-18.03	-6.01	-16.57	-10.27
OVERALL STD DEV (S)	45.86	24.10	43.14	24.54	33.29	30.22	48.01	41.16	39.93	65.57	44.75	36.86
OVERALL REL STD DEV, %	38.60	16.14	36.49	17.32	27.79	21.49	36.54	25.91	32.69	41.29	36.00	24.31
SINGLE STD DEV, (SR)	22.40		42.03		28.99		43.42		60.45		25.39	
ANALYST REL DEV, %	16.72		32.35		22.27		29.92		43.02		18.40	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	15	16	15	15	18	19	17	17	17	18	17	17
TRUE VALUE UG/L	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00
MEAN RECOVERY	257.64	267.53	244.81	299.31	252.39	297.14	273.78	285.18	268.03	309.19	276.92	290.35
ACCURACY AS % REL ERROR	-13.94	-20.89	-17.89	-11.49	-15.31	-12.09	-8.13	-15.63	-10.06	-8.52	-7.07	-11.10
OVERALL STD DEV (S)	31.67	63.47	59.30	70.21	75.21	81.99	82.59	102.77	66.57	125.35	68.62	105.90
OVERALL REL STD DEV, %	12.29	23.73	24.22	23.46	29.80	27.57	30.09	36.04	24.84	40.54	24.78	36.47
SINGLE STD DEV, (SR)	37.57		61.55		30.44		56.01		50.10		53.22	
ANALYST REL DEV, %	14.31		22.62		11.08		20.04		17.36		18.76	

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON OC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE 15. (CONTINUED)

I M V S: PAGE 473

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-17 ENV PHENOLS:FID
STATISTICAL SUMMARY FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR

NUMBER OF DATA POINTS	1	2
TRUE VALUE UG/L	29.80	31.60
MEAN RECOVERY	21.34	26.40
ACCURACY AS % REL ERROR	-21.68	-21.43
OVERALL STD DEV (S)	8.28	7.33
OVERALL REL STD DEV, %	35.48	27.77
SINGLE STD DEV, (SR)		3.11
ANALYST REL DEV, %		12.52

MEDIUM YOUNG PAIR

NUMBER OF DATA POINTS	3	5
TRUE VALUE UG/L	149.00	169.00
MEAN RECOVERY	129.00	135.09
ACCURACY AS % REL ERROR	-13.42	-20.07
OVERALL STD DEV (S)	37.85	26.11
OVERALL REL STD DEV, %	25.34	19.33
SINGLE STD DEV, (SR)		21.38
ANALYST REL DEV, %		16.19

HIGH YOUNG PAIR

NUMBER OF DATA POINTS	4	6
TRUE VALUE UG/L	298.00	338.00
MEAN RECOVERY	228.13	305.00
ACCURACY AS % REL ERROR	-23.45	-9.76
OVERALL STD DEV (S)	123.72	65.34
OVERALL REL STD DEV, %	54.23	21.42
SINGLE STD DEV, (SR)		99.57
ANALYST REL DEV, %		37.35

WATER LEGEND

7 - TAP WATER - DC

TABLE 16.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS&PID

STATISTICAL SUMMARY FOR 2,4-DINITROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	14	15	14	14	18	17	15	13	14	13	15	15
TRUE VALUE UG/L	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00
MEAN RECOVERY	22.56	21.03	29.39	28.51	33.35	29.94	35.33	24.40	40.85	29.45	34.83	35.56
ACCURACY AS % REL ERROR	-29.49	-22.10	-8.15	-1.81	4.23	10.87	10.40	-9.64	27.66	9.10	8.84	31.71
OVERALL STD DEV (S)	9.23	11.83	11.01	9.14	14.13	11.97	11.00	10.28	22.11	12.42	17.09	20.74
OVERALL REL STD DEV, %	42.24	56.24	37.47	34.48	42.35	39.98	31.14	42.12	54.13	42.16	49.07	58.31
SINGLE STD DEV, (SR)	4.74	4.33	4.33	4.33	9.96	9.96	10.26	10.26	8.83	8.83	14.17	14.17
ANALYST REL DEV, %	21.75	15.51	15.51	15.51	31.47	31.47	34.34	34.34	25.12	25.12	40.25	40.25
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	19	18	15	15	18	18	18	17	17	17	16	17
TRUE VALUE UG/L	160.00	136.00	160.00	136.00	160.00	136.00	160.00	136.00	160.00	136.00	160.00	136.00
MEAN RECOVERY	128.00	110.24	133.74	113.57	140.51	120.59	141.16	139.50	150.97	148.09	132.26	120.16
ACCURACY AS % REL ERROR	-20.00	-19.91	-16.42	-16.49	-12.18	-11.33	-11.77	2.57	-5.64	8.89	-17.34	-11.83
OVERALL STD DEV (S)	62.77	25.98	46.31	44.01	48.79	40.26	62.99	50.88	57.84	60.72	52.88	32.94
OVERALL REL STD DEV, %	49.04	23.19	34.83	38.75	34.73	33.39	44.62	36.48	36.31	41.00	39.98	27.41
SINGLE STD DEV, (SR)	35.72	52.83	52.83	52.83	39.35	39.35	58.78	58.78	53.99	53.99	34.52	34.52
ANALYST REL DEV, %	29.99	42.73	42.73	42.73	30.14	30.14	41.89	41.89	36.11	36.11	27.35	27.35
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	18	18	14	14	18	18	19	17	17	17	17	17
TRUE VALUE UG/L	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00
MEAN RECOVERY	269.38	198.73	269.32	251.86	288.65	249.73	329.33	227.15	319.86	277.20	301.29	295.39
ACCURACY AS % REL ERROR	-15.82	-25.94	-13.94	-6.87	-9.80	-8.19	2.91	-16.49	-0.04	1.91	-5.85	-6.11
OVERALL STD DEV (S)	59.27	67.88	116.63	57.93	125.86	77.08	112.59	101.83	72.97	109.87	75.00	80.69
OVERALL REL STD DEV, %	22.00	34.16	43.31	22.82	43.60	30.86	34.19	44.83	22.81	39.64	24.89	31.59
SINGLE STD DEV, (SR)	55.42	71.27	71.27	71.27	57.87	57.87	77.39	77.39	78.18	78.18	60.38	60.38
ANALYST REL DEV, %	23.68	27.24	27.24	27.24	21.50	21.50	27.82	27.82	26.19	26.19	21.69	21.69

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 16. (CONTINUED)

I M V S: PAGE 523

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

STATISTICAL SUMMARY FOR 2,4-DINITROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 5
TRUE VALUE UG/L 32.00 27.00
MEAN RECOVERY 29.33 20.98
ACCURACY AS % REL ERROR -11.48 -22.30
OVERALL STD DEV (S) 15.79 9.25
OVERALL REL STD DEV, % 55.75 44.09
SINGLE STD DEV, (SR) 11.53
ANALYST REL DEV, % 46.77

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 6
TRUE VALUE UG/L 160.00 136.00
MEAN RECOVERY 195.17 134.08
ACCURACY AS % REL ERROR 21.98 -1.41
OVERALL STD DEV (S) 109.40 94.48
OVERALL REL STD DEV, % 56.05 70.46
SINGLE STD DEV, (SR) 33.42
ANALYST REL DEV, % 20.30

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 320.00 272.00
MEAN RECOVERY 259.83 216.12
ACCURACY AS % REL ERROR -18.86 -20.55
OVERALL STD DEV (S) 175.54 129.93
OVERALL REL STD DEV, % 67.65 50.12
SINGLE STD DEV, (SR) 69.01
ANALYST REL DEV, % 29.01

WATER LEGEND

7 - TAP WATER - DC

TABLE 17.

I N V S I PAGE 22

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

STATISTICAL SUMMARY FOR PHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	14	13	8	7	13	14	15	15	16	14	16	12
TRUE VALUE UG/L	20.40	19.40	20.40	19.40	20.40	18.40	20.40	18.40	20.40	18.40	20.40	18.40
MEAN RECOVERY	6.55	7.12	6.79	3.95	8.06	8.66	7.49	5.29	11.20	8.62	7.35	6.12
ACCURACY AS % REL ERROR	-67.90	-61.10	-64.72	-78.54	-60.49	-52.91	-63.27	-71.27	-45.10	-53.15	-63.99	-66.74
OVERALL STD DEV (S)	4.16	4.28	5.73	2.59	4.47	8.94	5.80	4.56	8.90	6.38	8.59	3.34
OVERALL REL STD DEV, %	63.55	60.12	84.41	65.73	55.50	98.32	77.46	86.18	84.89	74.01	89.65	54.59
SINGLE STD DEV, (SR)	2.46		2.95		1.66		1.70		3.63		3.61	
ANALYST REL DEV, %	35.94		55.02		19.62		26.56		36.58		53.58	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	16	12	10	15	17	16	17	16	18	15	19
TRUE VALUE UG/L	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20
MEAN RECOVERY	39.19	37.09	26.17	29.78	30.23	33.50	28.57	30.87	27.36	47.22	28.08	31.79
ACCURACY AS % REL ERROR	-61.19	-59.33	-74.09	-67.34	-70.06	-63.26	-71.71	-66.15	-72.91	-48.22	-72.20	-65.14
OVERALL STD DEV (S)	14.19	19.29	17.72	17.69	14.60	13.68	12.40	17.32	12.38	26.83	15.31	24.11
OVERALL REL STD DEV, %	36.21	52.01	67.73	59.38	48.28	40.83	43.39	56.09	45.26	56.62	54.52	75.83
SINGLE STD DEV, (SR)	8.07		14.31		9.42		16.03		19.08		11.80	
ANALYST REL DEV, %	21.15		51.15		26.54		53.93		51.17		39.42	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	16	17	13	13	17	16	17	17	19	19	18	15
TRUE VALUE UG/L	252.00	224.00	252.00	224.00	252.00	224.00	252.00	224.00	252.00	224.00	252.00	224.00
MEAN RECOVERY	79.63	81.37	85.52	62.93	87.13	83.80	76.15	65.40	89.43	83.65	76.48	78.73
ACCURACY AS % REL ERROR	-68.78	-64.31	-66.03	-72.44	-65.42	-63.24	-69.78	-55.56	-64.51	-63.31	-69.65	-65.47
OVERALL STD DEV (S)	34.48	39.54	64.59	45.27	26.91	25.70	34.53	44.38	32.67	37.16	41.33	35.08
OVERALL REL STD DEV, %	43.83	43.90	80.23	72.05	30.87	30.67	45.38	63.96	36.53	44.43	54.04	44.56
SINGLE STD DEV, (SR)	19.87		42.27		27.47		33.99		22.78		21.58	
ANALYST REL DEV, %	24.83		56.95		32.14		46.71		26.32		27.80	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - MON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 17. (CONTINUED)

I M V S: PAGE 23

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSLSEC

STATISTICAL SUMMARY FOR PHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR

NUMBER OF DATA POINTS	1	2
TRUE VALUE UG/L	20.40	18.40
MEAN RECOVERY	5.69	5.96
ACCURACY AS % REL ERROR	-67.19	-67.60
OVERALL STD DEV (S)	3.71	3.00
OVERALL REL STD DEV, %	55.37	50.27

SINGLE ANALYST	STD DEV, (SR)	1.07
REL DEV, %		16.88

MEDIUM YOUNG PAIR

NUMBER OF DATA POINTS	3	5
TRUE VALUE UG/L	101.00	91.20
MEAN RECOVERY	25.50	36.32
ACCURACY AS % REL ERROR	-74.75	-65.37
OVERALL STD DEV (S)	12.06	16.94
OVERALL REL STD DEV, %	47.28	46.36

SINGLE ANALYST	STD DEV, (SR)	12.71
REL DEV, %		42.49

HIGH YOUNG PAIR

NUMBER OF DATA POINTS	4	6
TRUE VALUE UG/L	252.00	228.00
MEAN RECOVERY	63.25	64.12
ACCURACY AS % REL ERROR	-74.90	-71.88
OVERALL STD DEV (S)	41.71	41.13
OVERALL REL STD DEV, %	65.94	64.14

SINGLE ANALYST	STD DEV, (SR)	13.12
REL DEV, %		20.61

WATER LEGEND

7 - TAP WATER - DC

TABLE 18.

I M V S: PAGE 72

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-11 ENV PHENOLS:EC

STATISTICAL SUMMARY FOR 2,4-DIMETHYLPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNDEN PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	17	15	13	15	13	15	13	15	13	15	13	15
TRUE VALUE UG/L	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20
MEAN RECOVERY	8.46	5.96	5.46	2.45	4.33	8.43	5.34	8.78	5.42	5.56	10.01	8.54
ACCURACY AS % REL ERROR	-34.94	-60.77	-49.59	-83.87	-62.04	-44.41	-37.37	-68.54	-35.21	-63.45	-22.97	-43.80
OVERALL STD DEV (S)	6.46	3.19	6.05	1.93	4.38	8.16	3.66	2.61	7.65	4.06	6.49	8.05
OVERALL REL STD DEV, %	76.33	51.52	92.27	62.47	88.90	96.57	66.11	54.51	90.79	73.00	64.83	94.18
SINGLE STD DEV, (SR)	3.45	2.34	3.45	1.99	4.70	8.70	1.69	32.72	3.58	51.17	4.48	48.26
ANALYST	47.89	51.99	47.89	51.99	47.89	51.99	47.89	51.99	47.89	51.99	47.89	51.99
MEDIUM YOUNDEN PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	16	18	16	18	16	18	16	18	16	18	16	18
TRUE VALUE UG/L	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60
MEAN RECOVERY	26.54	25.13	4.15	13.07	13.67	21.44	15.50	16.48	14.72	30.73	19.18	23.82
ACCURACY AS % REL ERROR	-12.70	-30.50	-89.71	-65.24	-55.03	-42.98	-49.01	-54.16	-51.58	-18.27	-36.90	-36.64
OVERALL STD DEV (S)	19.47	14.91	2.11	13.68	6.26	8.37	10.74	6.09	8.82	27.67	10.94	13.01
OVERALL REL STD DEV, %	73.76	63.17	44.61	104.66	45.79	39.05	69.27	55.12	56.94	90.04	57.05	54.60
SINGLE STD DEV, (SR)	10.14	10.06	10.14	10.06	9.25	9.25	8.66	19.97	8.66	19.97	8.66	19.97
ANALYST	38.50	115.51	38.50	115.51	20.93	20.93	54.15	87.88	54.15	87.88	54.15	87.88
HIGH YOUNDEN PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	17	18	17	18	17	18	17	18	17	18	17	18
TRUE VALUE UG/L	122.00	151.00	122.00	151.00	122.00	151.00	122.00	151.00	122.00	151.00	122.00	151.00
MEAN RECOVERY	66.19	93.95	33.19	46.72	56.96	66.66	45.27	56.83	57.42	63.81	44.87	52.19
ACCURACY AS % REL ERROR	-45.75	-37.78	-72.79	-69.06	-53.31	-55.85	-62.89	-62.36	-52.93	-57.74	-63.22	-65.44
OVERALL STD DEV (S)	45.81	52.71	22.96	25.59	30.89	33.93	20.52	23.00	42.21	48.49	29.18	41.37
OVERALL REL STD DEV, %	69.21	56.10	69.16	56.91	54.24	50.90	45.33	43.99	73.51	76.00	65.03	79.28
SINGLE STD DEV, (SR)	27.52	21.35	27.52	21.35	23.49	23.49	24.80	30.71	24.80	30.71	24.80	30.71
ANALYST	34.30	93.42	34.30	93.42	38.01	38.01	48.57	50.66	48.57	50.66	48.57	50.66

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 18. (CONTINUED)

I M V S: PAGE 73

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL:SEC

STATISTICAL SUMMARY FOR 2,4-DIMETHYLPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR 1 2
NUMBER OF DATA POINTS 6 6
TRUE VALUE UG/L 13.00 15.20
MEAN RECOVERY 7.00 7.44
ACCURACY AS % REL ERROR -46.17 -51.06
OVERALL STD DEV (S) 3.62 3.40
OVERALL REL STD DEV, % 51.67 45.73

SINGLE STD DEV, (SR) 1.39
ANALYST REL DEV, % 19.25

MEDIUM YOUNG PAIR 3 5
NUMBER OF DATA POINTS 6 6
TRUE VALUE UG/L 30.40 37.60
MEAN RECOVERY 20.00 26.50
ACCURACY AS % REL ERROR -34.23 -29.52
OVERALL STD DEV (S) 12.19 11.37
OVERALL REL STD DEV, % 60.97 42.92

SINGLE STD DEV, (SR) 14.95
ANALYST REL DEV, % 64.31

HIGH YOUNG PAIR 4 6
NUMBER OF DATA POINTS 6 6
TRUE VALUE UG/L 122.00 151.00
MEAN RECOVERY 62.68 78.22
ACCURACY AS % REL ERROR -48.62 -48.20
OVERALL STD DEV (S) 47.11 60.54
OVERALL REL STD DEV, % 75.16 77.41

SINGLE STD DEV, (SR) 16.00
ANALYST REL DEV, % 22.72

WATER LEGEND

7 - TAP WATER - DC

TABLE 19.

I M V 51 PAGE 122

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSTEC

STATISTICAL SUMMARY FOR 2-CHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	13	15	13	14	15	15	17	15	15	15	14	14
TRUE VALUE UG/L	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20
MEAN RECOVERY	7.68	6.13	6.22	6.53	7.77	6.97	8.26	6.73	8.75	7.64	10.46	7.80
ACCURACY AS % REL ERROR	-47.38	-49.74	-43.71	-46.50	-46.74	-42.85	-43.44	-44.66	-40.08	-37.36	-28.37	-36.03
OVERALL STD DEV (S)	3.24	3.20	4.59	4.40	5.13	4.12	5.99	5.52	6.75	5.70	4.55	3.79
OVERALL REL STD DEV, %	42.13	52.17	55.86	67.41	66.05	50.11	72.55	81.75	77.12	74.55	43.99	48.55
SINGLE STD DEV, (SR)	2.09		1.25		3.73		3.67		4.63		2.86	
ANALYST REL DEV, %	30.24		16.92		50.63		48.96		56.94		31.28	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	14	15	14	15	17	18	17	15	17	15	15
TRUE VALUE UG/L	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40
MEAN RECOVERY	22.61	23.61	23.93	38.34	23.00	18.90	21.00	16.82	24.47	40.34	26.75	31.03
ACCURACY AS % REL ERROR	-38.90	-22.33	-35.59	26.79	-37.84	-37.84	-43.26	-44.66	-33.85	32.69	-27.69	2.08
OVERALL STD DEV (S)	16.41	12.78	14.95	18.49	12.83	7.32	13.15	8.62	15.78	29.14	17.62	26.51
OVERALL REL STD DEV, %	72.61	54.12	61.48	47.97	55.77	38.75	62.65	51.22	64.48	72.23	65.87	89.41
SINGLE STD DEV, (SR)	11.71		19.86		8.67		11.79		18.37		19.46	
ANALYST REL DEV, %	50.67		63.67		41.40		62.37		56.70		67.35	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	14	15	14	14	17	16	19	17	15	18	16	15
TRUE VALUE UG/L	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00
MEAN RECOVERY	77.06	78.01	98.12	118.27	97.48	85.91	96.70	82.82	107.28	86.76	112.90	92.89
ACCURACY AS % REL ERROR	-58.34	-48.67	-45.96	-22.19	-47.20	-43.48	-47.73	-45.52	-42.01	-42.92	-38.97	-38.89
OVERALL STD DEV (S)	40.08	27.04	60.11	57.19	50.15	37.80	45.84	43.86	35.30	42.93	59.34	56.06
OVERALL REL STD DEV, %	52.02	34.67	61.26	48.35	51.35	43.99	47.40	52.96	32.90	49.48	52.56	60.35
SINGLE STD DEV, (SR)	24.54		58.90		32.09		29.08		37.52		48.33	
ANALYST REL DEV, %	31.65		54.44		34.96		32.40		38.67		46.97	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 19. (CONTINUED)

I M V S: PAGE 123

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSL:EC

STATISTICAL SUMMARY FOR 2-CHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR 1 2
 NUMBER OF DATA POINTS 5 5
 TRUE VALUE UG/L 14.60 12.20
 MEAN RECOVERY 6.16 6.25
 ACCURACY AS % REL ERROR -57.78 -48.79
 OVERALL STD DEV (S) 2.93 3.50
 OVERALL REL STD DEV, % 47.46 56.37
 SINGLE STD DEV, (SR) .62
 ANALYST REL DEV, % 9.98

MEDIUM YOUNG PAIR 3 5
 NUMBER OF DATA POINTS 5 5
 TRUE VALUE UG/L 37.00 30.40
 MEAN RECOVERY 14.36 27.18
 ACCURACY AS % REL ERROR -61.19 -10.59
 OVERALL STD DEV (S) 5.11 28.18
 OVERALL REL STD DEV, % 42.55 89.27
 SINGLE STD DEV, (SR) 6.96
 ANALYST REL DEV, % 33.49

HIGH YOUNG PAIR 4 6
 NUMBER OF DATA POINTS 5 5
 TRUE VALUE UG/L 185.00 192.00
 MEAN RECOVERY 72.68 70.85
 ACCURACY AS % REL ERROR -60.71 -53.39
 OVERALL STD DEV (S) 17.49 48.16
 OVERALL REL STD DEV, % 24.07 67.98
 SINGLE STD DEV, (SR) 11.18
 ANALYST REL DEV, % 15.57

WATER LEGEND

7 - TAP WATER - DC

TABLE 20.

I M V S: PAGE 172

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSI/EC

STATISTICAL SUMMARY FOR 4-CHLORO-3-METHYLPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	17	17	14	13	15	15	17	17	16	16	17	17
TRUE VALUE UG/L	30.00	36.00	30.00	36.00	30.00	36.00	36.00	36.00	30.00	36.00	30.00	36.00
MEAN RECOVERY	17.74	20.81	11.92	10.28	18.37	24.73	18.07	18.37	21.84	22.39	19.01	16.59
ACCURACY AS % REL ERROR	-40.47	-42.20	-60.77	-71.45	-39.76	-31.29	-39.78	-48.96	-27.20	-37.93	-36.62	-53.91
OVERALL STD DEV (S)	11.21	11.21	7.76	6.40	9.87	13.15	12.48	13.33	15.73	16.11	11.77	11.61
OVERALL REL STD DEV, %	63.22	53.97	65.15	62.27	53.69	61.26	69.08	72.56	72.02	72.10	61.90	69.95
SINGLE STD DEV, (SR)	7.00	6.15	6.15	6.15	11.16	11.16	5.53	5.53	7.01	7.01	8.68	8.68
ANALYST REL DEV, %	36.34	37.41	37.41	37.41	51.78	51.78	30.33	30.33	31.71	31.71	49.74	49.74
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	17	17	13	14	15	15	17	18	15	16	18	17
TRUE VALUE UG/L	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00	150.00	180.00
MEAN RECOVERY	123.21	139.94	76.37	94.07	98.52	116.57	76.32	93.02	91.30	130.98	71.55	91.59
ACCURACY AS % REL ERROR	-17.86	-24.48	-49.08	-33.29	-34.32	-35.24	-49.12	-48.32	-39.13	-27.23	-52.30	-49.29
OVERALL STD DEV (S)	64.37	81.73	48.10	57.70	56.12	50.17	48.23	59.03	44.58	51.09	51.29	56.02
OVERALL REL STD DEV, %	52.24	60.12	62.98	63.63	56.97	43.04	63.20	63.47	48.83	39.01	71.68	61.37
SINGLE STD DEV, (SR)	49.18	36.40	36.40	36.40	25.95	25.95	48.72	48.72	30.68	30.68	52.00	52.00
ANALYST REL DEV, %	37.96	45.37	45.37	45.37	24.13	24.13	57.54	57.54	33.00	33.00	63.86	63.86
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	17	17	15	15	16	16	17	18	15	16	17	15
TRUE VALUE UG/L	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00
MEAN RECOVERY	230.65	292.01	162.26	182.07	239.50	263.60	212.78	267.95	193.13	258.53	174.87	205.07
ACCURACY AS % REL ERROR	-39.38	-35.11	-56.52	-37.98	-35.96	-41.42	-43.11	-40.46	-46.36	-42.55	-53.24	-54.43
OVERALL STD DEV (S)	121.64	146.86	104.42	120.24	107.57	124.33	76.64	154.96	51.16	131.24	92.16	89.32
OVERALL REL STD DEV, %	52.79	50.29	54.41	63.59	44.95	47.16	37.43	57.83	26.49	50.76	52.70	43.56
SINGLE STD DEV, (SR)	68.77	50.09	50.09	50.09	70.79	70.79	99.58	99.58	68.17	68.17	44.40	44.40
ANALYST REL DEV, %	26.33	28.92	28.92	28.92	28.14	28.14	41.43	41.43	30.19	30.19	23.37	23.37

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE 20. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 173

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

STATISTICAL SUMMARY FOR 4-CHLORO-3-METHYLPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 30.00 35.00
MEAN RECOVERY 12.16 12.44
ACCURACY AS % REL ERROR -59.53 -65.44
OVERALL STD DEV (S) 4.95 3.09
OVERALL REL STD DEV, % 40.74 24.63
SINGLE STD DEV, (Sp) .38
ANALYST REL DEV, % 3.07

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 150.00 180.00
MEAN RECOVERY 59.06 91.44
ACCURACY AS % REL ERROR -60.63 -48.09
OVERALL STD DEV (S) 20.77 59.71
OVERALL REL STD DEV, % 35.17 63.90
SINGLE STD DEV, (Sp) 32.16
ANALYST REL DEV, % 42.17

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 374.00 450.00
MEAN RECOVERY 226.40 239.72
ACCURACY AS % REL ERROR -39.47 -46.73
OVERALL STD DEV (S) 124.75 158.01
OVERALL REL STD DEV, % 55.10 65.91
SINGLE STD DEV, (Sp) 41.00
ANALYST REL DEV, % 17.59

WATER LEGEND

7 - TAP WATER - DC

TABLE 21.

I M V 50 PAGE 222

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

STATISTICAL SUMMARY FOR 2,4-DICHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	14	15	15	15	15	15	17	15	14	14	16
TRUE VALUE UG/L	14.40	17.00	14.40	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00
MEAN RECOVERY	9.36	9.33	7.78	9.14	10.10	10.92	11.43	10.32	12.45	10.91	9.25	10.62
ACCURACY AS % REL ERROR	-36.78	-43.12	-47.45	-46.22	-31.78	-35.75	-22.76	-39.29	-15.49	-35.84	-35.48	-37.53
OVERALL STD DEV (S)	5.10	4.92	3.77	4.28	5.37	7.16	6.12	4.96	9.45	3.58	5.40	5.27
OVERALL REL STD DEV, %	54.56	52.73	48.53	46.82	55.21	65.55	53.57	48.04	79.13	32.82	56.53	49.60
SINGLE STD DEV, (SR)	3.79	1.77	1.77	5.19	4.42	4.42	4.42	4.42	6.08	4.07	4.07	4.07
ANALYST REL DEV, %	40.54	20.90	20.90	49.41	40.65	40.65	40.65	40.65	52.10	40.36	40.36	40.36
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	14	13	15	15	15	16	17	15	16	16	17	15
TRUE VALUE UG/L	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00
MEAN RECOVERY	82.96	94.83	76.27	121.81	73.37	104.05	73.77	85.96	84.62	99.60	74.14	93.45
ACCURACY AS % REL ERROR	-25.92	-26.72	-31.90	-35.58	-34.49	-19.34	-34.13	-33.36	-24.45	-25.69	-33.80	-27.56
OVERALL STD DEV (S)	40.12	19.06	32.29	86.48	47.30	45.23	33.86	31.65	52.43	31.91	43.55	34.92
OVERALL REL STD DEV, %	48.35	20.16	42.34	71.00	64.46	43.47	45.90	36.82	61.96	33.38	58.74	37.37
SINGLE STD DEV, (SR)	17.76	48.70	49.17	22.27	29.52	29.52	29.52	29.52	41.01	35.77	35.77	35.77
ANALYST REL DEV, %	20.02	49.17	49.17	25.11	36.97	36.97	36.97	36.97	45.50	42.68	42.68	42.68
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	15	14	15	14	15	16	17	15	16	16	16	13
TRUE VALUE UG/L	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00	186.00	214.00
MEAN RECOVERY	129.25	154.60	130.84	142.32	106.33	163.63	148.73	150.78	120.37	148.91	151.23	125.65
ACCURACY AS % REL ERROR	-30.51	-27.76	-29.66	-33.50	-41.76	-23.44	-20.04	-29.34	-39.28	-30.42	-18.89	-41.29
OVERALL STD DEV (S)	56.07	54.43	64.84	57.73	34.42	83.02	60.18	79.11	35.33	69.65	85.14	29.79
OVERALL REL STD DEV, %	43.38	42.26	51.04	40.56	31.77	50.68	40.46	52.47	29.35	46.78	56.29	23.71
SINGLE STD DEV, (SR)	26.79	49.30	49.30	63.09	63.09	63.09	63.09	63.09	48.45	34.06	34.06	34.06
ANALYST REL DEV, %	18.88	36.10	36.10	46.36	46.36	46.36	46.36	46.36	35.98	24.60	24.60	24.60

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 21. (CONTINUED)

I N V S I PAGE 223

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSTEC

STATISTICAL SUMMARY FOR 2,4-DICHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 14.00 17.00
MEAN RECOVERY 10.21 11.43
ACCURACY AS % REL ERROR -31.01 -32.78
OVERALL STD DEV (S) 4.52 2.70
OVERALL REL STD DEV, % 45.25 23.46
SINGLE STD DEV, (SR) 3.24
ANALYST REL DEV, % 29.96

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 112.00 129.00
MEAN RECOVERY 100.20 104.22
ACCURACY AS % REL ERROR -10.54 -19.21
OVERALL STD DEV (S) 70.38 49.98
OVERALL REL STD DEV, % 70.24 47.98
SINGLE STD DEV, (SR) 60.16
ANALYST REL DEV, % 58.86

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 186.00 214.00
MEAN RECOVERY 205.28 210.35
ACCURACY AS % REL ERROR 10.37 -1.71
OVERALL STD DEV (S) 119.79 130.76
OVERALL REL STD DEV, % 58.35 62.16
SINGLE STD DEV, (SR) 32.32
ANALYST REL DEV, % 15.59

WATER LEGEND

7 - TAP WATER - DC

TABLE 22.

I M V S: PAGE 272

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLS:EC

STATISTICAL SUMMARY FOR 2,4,6-TRICHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	15	13	13	18	17	18	18	16	15	17	19
TRUE VALUE UG/L	20.40	23.50	20.40	23.50	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60
MEAN RECOVERY	12.69	13.30	14.18	14.71	14.00	19.62	16.11	17.43	16.14	18.82	16.30	17.28
ACCURACY AS % REL ERROR	-37.80	-43.64	-30.31	-37.66	-31.98	-16.85	-21.02	-26.17	-30.68	-37.20	-20.10	-26.77
OVERALL STD DEV (S)	6.24	8.94	4.31	6.16	7.26	15.53	9.32	9.18	9.59	6.00	6.87	7.87
OVERALL REL STD DEV, %	49.50	67.21	30.39	41.90	51.84	79.12	57.82	52.71	67.78	40.49	42.12	45.56
SINGLE STD DEV, (SR)	3.96	2.06	2.06	2.06	10.03	5.75	5.75	5.75	4.92	5.23	5.23	5.23
ANALYST REL DEV, %	30.47	14.30	14.30	14.30	50.80	34.31	34.31	34.31	34.01	31.15	31.15	31.15
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	14	14	13	12	14	17	17	17	17	17	17	17
TRUE VALUE UG/L	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00
MEAN RECOVERY	37.20	49.78	39.31	51.26	28.31	43.16	35.91	47.46	34.34	52.90	32.95	43.90
ACCURACY AS % REL ERROR	-25.90	-17.32	-20.70	-13.12	-43.60	-26.85	-25.47	-16.55	-31.59	-10.33	-34.36	-25.59
OVERALL STD DEV (S)	14.13	10.37	16.94	19.20	13.32	18.18	15.16	23.11	14.63	30.62	15.90	14.18
OVERALL REL STD DEV, %	37.97	21.26	42.56	37.47	47.04	42.11	42.23	52.90	42.59	57.88	48.25	32.30
SINGLE STD DEV, (SR)	9.20	17.63	17.63	17.63	14.33	13.31	13.31	13.31	27.46	12.99	12.99	12.99
ANALYST REL DEV, %	21.40	38.72	38.72	38.72	40.10	32.42	32.42	32.42	62.94	33.81	33.81	33.81
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	16	16	14	14	16	17	18	18	17	17	16	17
TRUE VALUE UG/L	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00
MEAN RECOVERY	150.08	176.64	129.99	213.27	119.02	185.42	154.83	186.47	128.31	153.18	136.31	157.20
ACCURACY AS % REL ERROR	-24.98	-25.14	-35.05	-9.53	-40.49	-29.91	-22.58	-20.99	-31.75	-35.09	-31.84	-33.59
OVERALL STD DEV (S)	67.79	76.80	71.59	71.72	48.86	65.07	50.69	98.55	35.25	76.04	50.31	43.81
OVERALL REL STD DEV, %	45.17	43.48	54.96	33.63	41.05	39.33	38.55	52.85	27.43	46.64	36.91	27.87
SINGLE STD DEV, (SR)	63.73	61.08	61.08	61.08	44.17	57.09	57.09	57.09	62.25	31.65	31.65	31.65
ANALYST REL DEV, %	39.01	35.60	35.60	35.60	31.06	33.46	33.46	33.46	44.20	21.57	21.57	21.57

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 22. (CONTINUED)

I M V S: PAGE 273

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSRIC

STATISTICAL SUMMARY FOR 2,4,6-TRICHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 20.40 21.60
MEAN RECOVERY 14.27 17.88
ACCURACY AS % REL ERROR -30.06 -24.22
OVERALL STD DEV (S) 4.76 2.58
OVERALL REL STD DEV, % 33.49 14.40
SINGLE STD DEV, (SR) 2.62
ANALYST REL DEV, % 16.31

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 50.20 50.00
MEAN RECOVERY 34.89 60.22
ACCURACY AS % REL ERROR -30.58 2.06
OVERALL STD DEV (S) 3.43 28.48
OVERALL REL STD DEV, % 9.85 47.29
SINGLE STD DEV, (SR) 20.76
ANALYST REL DEV, % 43.67

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 5
TRUE VALUE UG/L 200.00 236.00
MEAN RECOVERY 163.20 185.04
ACCURACY AS % REL ERROR -18.40 -10.07
OVERALL STD DEV (S) 51.25 81.51
OVERALL REL STD DEV, % 31.40 49.19
SINGLE STD DEV, (SR) 33.87
ANALYST REL DEV, % 20.64

WATER LEGEND

7 - TAP WATER - DC

TABLE 23.

I M V 5: PAGE 322

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY—IT ENV PHENOL/SIEC

STATISTICAL SUMMARY FOR PENTACHLOROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	14	14	13	13	15	14	16	12	16	13	15	15
TRUE VALUE UG/L	17.80	14.20	17.80	15.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20
MEAN RECOVERY	10.65	9.98	9.28	11.17	9.21	7.45	47.44	49.62	11.93	11.40	9.36	11.43
ACCURACY AS % REL ERROR	-10.17	-32.01	-47.46	-31.04	-48.24	-54.00	166.50	206.29	-33.01	-29.62	-47.39	-29.30
OVERALL STD DEV (S)	5.32	3.76	4.52	5.33	5.15	3.58	52.56	47.93	5.49	4.03	4.99	5.31
OVERALL REL STD DEV, %	49.98	31.02	48.67	47.72	55.87	48.09	110.79	96.61	46.07	35.31	53.26	46.35
SINGLE STD DEV, (SR)	2.45		4.55		3.31		21.27		4.65		3.44	
ANALYST REL DEV, %	23.85		44.53		39.69		43.84		39.90		33.04	
MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	17	17	14	13	16	18	16	17	18	18	17	17
TRUE VALUE UG/L	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00
MEAN RECOVERY	104.08	79.75	85.67	84.58	65.85	85.41	151.08	140.10	81.77	85.36	73.47	70.56
ACCURACY AS % REL ERROR	-22.90	-34.09	-36.94	-30.10	-48.26	-25.41	11.91	15.79	-39.43	-29.46	-45.58	-41.68
OVERALL STD DEV (S)	47.52	37.98	42.29	34.34	39.49	47.71	108.24	100.94	39.42	21.33	43.75	35.01
OVERALL REL STD DEV, %	45.05	47.12	49.37	40.60	56.53	55.86	71.64	72.05	48.20	24.99	59.54	49.61
SINGLE STD DEV, (SR)	41.36		41.10		27.27		66.91		31.76		21.64	
ANALYST REL DEV, %	44.99		48.29		35.13		45.06		38.00		30.03	
HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	17	17	14	15	17	15	17	14	18	17	16	16
TRUE VALUE UG/L	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00
MEAN RECOVERY	175.86	140.96	194.00	152.98	136.61	129.80	200.49	141.82	142.81	143.02	134.47	124.57
ACCURACY AS % REL ERROR	-22.19	-30.22	-31.51	-24.27	-39.55	-38.74	-11.29	-27.79	-36.81	-29.20	-40.50	-38.33
OVERALL STD DEV (S)	71.45	66.56	60.22	63.08	71.81	92.20	147.24	90.25	49.80	62.64	76.43	70.27
OVERALL REL STD DEV, %	40.85	47.01	36.90	41.82	52.56	40.22	73.44	63.64	34.87	43.83	56.83	56.41
SINGLE STD DEV, (SR)	33.18		37.04		46.83		91.97		54.86		49.43	
ANALYST REL DEV, %	20.94		24.07		35.16		53.73		38.39		38.17	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 23. (CONTINUED)

I M V S: PAGE 323

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSIPEC

STATISTICAL SUMMARY FOR PENTACHLOROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 17.80 15.20
MEAN RECOVERY 15.64 15.76
ACCURACY AS % REL ERROR -6.52 -4.80
OVERALL STD DEV (S) 2.15 3.23
OVERALL REL STD DEV, % 12.95 21.19
SINGLE STD DEV, (SR) 2.28
ANALYST REL DEV, % 14.27

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 5
TRUE VALUE UG/L 135.00 121.00
MEAN RECOVERY 113.88 101.40
ACCURACY AS % REL ERROR -15.64 -16.20
OVERALL STD DEV (S) 16.58 16.37
OVERALL REL STD DEV, % 14.56 15.10
SINGLE STD DEV, (SR) 14.92
ANALYST REL DEV, % 13.86

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 6
TRUE VALUE UG/L 226.00 202.00
MEAN RECOVERY 213.75 190.33
ACCURACY AS % REL ERROR -5.42 -5.78
OVERALL STD DEV (S) 45.46 13.50
OVERALL REL STD DEV, % 21.27 7.09
SINGLE STD DEV, (SR) 29.02
ANALYST REL DEV, % 14.36

WATER LEGEND

7 - TAP WATER - DC

TABLE 24.

I M V S: PAGE 372

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLs:EC

STATISTICAL SUMMARY FOR 2-NITROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	16	14	14	16	16	18	17	15	16	16	15
TRUE VALUE UG/L	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00
MEAN RECOVERY	13.07	14.02	13.49	14.77	15.39	19.46	16.32	17.73	15.27	16.66	14.19	15.49
ACCURACY AS % REL ERROR	-47.73	-33.27	-46.93	-30.78	-38.46	-35.12	-36.72	-40.91	-42.93	-44.47	-43.25	-46.38
OVERALL STD DEV (S)	6.71	10.03	5.76	8.41	8.66	11.93	9.90	6.15	6.68	8.94	7.91	5.93
OVERALL REL STD DEV, %	51.35	71.53	39.72	28.04	37.62	61.31	60.64	34.69	46.65	53.64	55.74	36.28
SINGLE STD DEV, (SR)	5.02		3.39		7.60		5.36		4.19		5.76	
ANALYST REL DEV, %	37.03		23.97		43.61		31.51		27.08		38.81	

MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	16	15	14	13	15	17	18	18	16	14	17	16
TRUE VALUE UG/L	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00
MEAN RECOVERY	82.44	91.85	77.94	84.12	71.22	99.48	74.23	83.17	80.25	88.42	73.46	90.75
ACCURACY AS % REL ERROR	-33.52	-38.76	-37.14	-43.92	-42.57	-33.68	-40.14	-44.59	-35.28	-41.06	-40.76	-39.50
OVERALL STD DEV (S)	37.75	35.56	32.00	34.84	36.52	36.84	34.77	32.61	38.52	17.59	48.47	43.15
OVERALL REL STD DEV, %	45.79	38.71	41.06	40.46	51.28	37.03	46.84	36.21	49.62	19.90	65.99	47.54
SINGLE STD DEV, (SR)	33.63		31.30		26.20		22.38		27.03		43.87	
ANALYST REL DEV, %	38.59		38.62		30.69		28.43		32.05		53.43	

HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	15	15	13	14	16	17	18	18	17	16	17	17
TRUE VALUE UG/L	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00
MEAN RECOVERY	164.05	215.85	171.92	208.80	154.98	191.72	197.92	214.92	185.77	203.63	179.07	207.29
ACCURACY AS % REL ERROR	-47.42	-42.29	-44.90	-44.17	-50.33	-46.74	-36.57	-42.54	-40.46	-45.55	-42.61	-44.58
OVERALL STD DEV (S)	69.32	94.95	84.42	101.68	80.98	87.91	80.47	127.73	70.50	98.13	95.92	79.05
OVERALL REL STD DEV, %	41.64	39.34	39.27	48.70	52.25	45.85	40.66	59.43	37.95	48.19	53.56	38.13
SINGLE STD DEV, (SR)	31.68		40.91		64.27		82.87		42.73		59.39	
ANALYST REL DEV, %	10.68		21.49		37.08		40.15		21.95		30.75	

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE 24. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SIEC

STATISTICAL SUMMARY FOR 2-NITROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR
NUMBER OF DATA POINTS 1 2
TRUE VALUE UG/L 25.00 30.00
MEAN RECOVERY 13.32 15.76
ACCURACY AS % REL ERROR -46.70 -46.13
OVERALL STD DEV (S) 5.20 5.33
OVERALL REL STD DEV, % 39.00 37.76
SINGLE STD DEV, (SR) 3.48
ANALYST REL DEV, % 25.82

MEDIUM YOUNG PAIR
NUMBER OF DATA POINTS 3 4
TRUE VALUE UG/L 124.00 150.00
MEAN RECOVERY 64.40 81.72
ACCURACY AS % REL ERROR -49.06 -45.52
OVERALL STD DEV (S) 17.49 30.49
OVERALL REL STD DEV, % 27.16 37.32
SINGLE STD DEV, (SR) 11.92
ANALYST REL DEV, % 16.31

HIGH YOUNG PAIR
NUMBER OF DATA POINTS 4 5
TRUE VALUE UG/L 312.00 374.00
MEAN RECOVERY 206.92 229.14
ACCURACY AS % REL ERROR -33.68 -34.73
OVERALL STD DEV (S) 111.47 132.01
OVERALL REL STD DEV, % 53.67 57.61
SINGLE STD DEV, (SR) 20.50
ANALYST REL DEV, % 6.40

WATER LEGEND

7 - TAP WATER - DC

TABLE 25.

I M V S: PAGE 422

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY—IT ENV PHENOLSI:EC
STATISTICAL SUMMARY FOR 4-NITROPHENOL ANALYSES BY WATER TYPE

	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LOW YOUNG PAIR	1	2	1	2	1	2	1	2	1	2	1	2
NUMBER OF DATA POINTS	15	16	14	14	15	15	17	15	13	15	15	16
TRUE VALUE UG/L	28.20	32.00	29.20	32.00	29.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00
MEAN RECOVERY	10.68	9.86	9.26	7.35	7.80	11.89	18.44	15.53	11.57	13.73	9.92	10.97
ACCURACY AS % REL ERROR	-62.13	-69.20	-70.72	-77.04	-72.33	-62.85	-33.18	-51.46	-58.96	-57.08	-64.83	-63.72
OVERALL STD DEV (S)	6.28	4.04	3.97	4.36	2.68	6.09	11.26	8.40	4.23	7.20	4.83	7.26
OVERALL REL STD DEV, %	58.85	61.30	48.04	59.33	34.31	51.20	59.73	54.10	36.57	52.39	48.75	66.22
SINGLE STD DEV, (SR)	4.02		2.87		4.29		7.33		5.51		3.32	
ANALYST REL DEV, %	39.17		36.74		43.54		42.64		43.56		31.78	

MEDIUM YOUNG PAIR	3	5	3	5	3	5	3	5	3	5	3	5
NUMBER OF DATA POINTS	15	16	13	14	15	17	15	15	14	14	16	16
TRUE VALUE UG/L	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00
MEAN RECOVERY	85.81	103.50	77.63	86.05	60.00	83.26	78.70	82.63	89.79	93.08	74.56	84.81
ACCURACY AS % REL ERROR	-59.14	-56.87	-63.03	-64.14	-71.43	-65.31	-62.53	-65.57	-37.24	-61.22	-64.50	-64.66
OVERALL STD DEV (S)	38.12	53.52	18.36	46.85	28.67	24.38	34.74	25.98	32.23	21.42	52.96	50.58
OVERALL REL STD DEV, %	44.42	51.71	23.65	54.44	47.79	29.53	44.15	30.96	35.89	23.02	71.03	59.64
SINGLE STD DEV, (SR)	42.23		34.20		15.11		23.89		18.47		34.78	
ANALYST REL DEV, %	44.62		41.79		21.09		29.62		20.20		43.64	

HIGH YOUNG PAIR	4	6	4	6	4	6	4	6	4	6	4	6
NUMBER OF DATA POINTS	15	14	13	15	16	17	17	14	15	14	16	16
TRUE VALUE UG/L	240.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00
MEAN RECOVERY	114.53	141.13	84.22	108.40	87.43	103.15	109.48	116.12	124.14	117.36	101.63	116.15
ACCURACY AS % REL ERROR	-59.13	-55.80	-69.21	-66.00	-68.77	-57.77	-60.83	-63.71	-55.67	-63.32	-63.71	-63.70
OVERALL STD DEV (S)	55.81	75.78	32.87	55.30	45.07	38.21	35.47	67.06	42.84	28.59	58.31	74.95
OVERALL REL STD DEV, %	48.73	59.28	35.13	50.83	51.55	37.05	32.34	57.75	34.51	24.36	57.37	64.53
SINGLE STD DEV, (SR)	37.42		34.64		40.39		43.28		30.66		57.02	
ANALYST REL DEV, %	29.27		35.53		42.39		38.33		25.39		52.37	

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE 25. (CONTINUED)

I M V S: PAGE 423

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSI/EC

STATISTICAL SUMMARY FOR 4-NITROPHENOL ANALYSES BY WATER TYPE

WATER 7

LOW YOUNG PAIR	1	2
NUMBER OF DATA POINTS	5	5
TRUE VALUE UG/L	28.20	32.00
MEAN RECOVERY	9.16	10.63
ACCURACY AS % REL ERROR	-67.53	-65.77
OVERALL STD DEV (S)	3.82	3.84
OVERALL REL STD DEV, %	41.77	36.25
SINGLE ANALYST	STD DEV, (SR)	3.75
REL DEV, %	37.92	

MEDIUM YOUNG PAIR	3	5
NUMBER OF DATA POINTS	5	5
TRUE VALUE UG/L	210.00	240.00
MEAN RECOVERY	73.68	65.64
ACCURACY AS % REL ERROR	-64.91	-72.65
OVERALL STD DEV (S)	25.91	26.52
OVERALL REL STD DEV, %	35.17	40.40
SINGLE ANALYST	STD DEV, (SR)	9.78
REL DEV, %	14.04	

HIGH YOUNG PAIR	4	6
NUMBER OF DATA POINTS	5	5
TRUE VALUE UG/L	280.00	320.00
MEAN RECOVERY	99.48	109.46
ACCURACY AS % REL ERROR	-64.47	-65.79
OVERALL STD DEV (S)	41.72	50.57
OVERALL REL STD DEV, %	41.93	46.20
SINGLE ANALYST	STD DEV, (SR)	14.92
REL DEV, %	14.29	

WATER LEGEND

7 - TAP WATER - DC

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

by the electron capture procedure, as determined by ranking and individual outlier test, ranged from one to thirteen and averaged about five outliers per data set. For all data for the nine phenols analyzed by the electron capture procedure, 23% of the data was rejected. Based on the concentration and water type for the specific compounds, the greatest percentage (28%) of outliers was obtained for 2,4-dimethylphenol and the lowest percentage of outliers (20%) for 2,4,6-trichlorophenol.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

Review and Interpretation of Data

The analysis of the tap water both dechlorinated and nondechlorinated allows a comparison of the data for both FID and EC analytical procedures. In comparing the nondechlorinated and dechlorinated finished drinking water raw data (Tables A-5 through A-64 in the Appendix) and data summaries (Tables 6 through 25) the following conclusions and observations were made:

1. The 2,4-dimethylphenol raw data results were highly scattered (high standard deviation) and significantly lower for the nondechlorinated water than for the dechlorinated water. There were in fact 38 data points reported as not detected or no data submitted for the nondechlorinated water versus none so reported for the dechlorinated water. The data definitely show that the 2,4-dimethylphenol was removed from the water by the residual chlorine either by chlorine addition or destruction.
2. The 2-chlorophenol results in the nondechlorinated water were significantly higher than in the dechlorinated water. The data also showed higher overall standard deviations for the nondechlorinated water. The chlorine was therefore probably producing 2-chlorophenol or an interference from the other phenols present. The logical expected route would be the chlorination of phenol. The overall phenol statistical results, however, show no significant difference for phenol between the nondechlorinated and dechlorinated tap water. If you compare, however, the raw data for only the four laboratories (Labs 21, 71, 171, and 191) that ran both the nondechlorinated and dechlorinated tap water, the concentrations of phenol found were less in the nondechlorinated than the dechlorinated drinking water. This, therefore, would support that 2-chlorophenol was being produced by chlorine addition to the phenol.
3. For the nondechlorinated tap water a number of data points for phenol by GC-EC were less than by GC-FID (several laboratories did not detect the phenol) especially the lower Youden pair, i.e., 17 data points reported by GC-EC versus 30 data points by GC-FID. There is no obvious explanation for this anomaly since the other water types do not show the same trend. A logical time for the loss would be between the analysis by GC-FID and the derivatization step for GC-EC analysis. In that time sequence, which would vary with the laboratory, the phenol or its derivative in the nondechlorinated extracts must have reacted or decomposed because of some component related to the original water sample's residual chlorine.

BEGIN
LAST LINE
OF TEXT

3/8"

68

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

4. The remaining compounds did not show an overall difference between non-dechlorinated and dechlorinated tap water.

The data anomalies outlined above for the tap water prove the need to dechlorinate samples for phenols analysis as soon as possible after collection. IT Enviroscience recommends further highlighting the need in the published method.

The analysis of the phenol extracts by GC-FID followed by derivatization, cleanup, and reanalysis by GC-EC for the six water types allows direct comparison of the two approaches in the same samples on nine of the eleven phenolic compounds (the two dinitrophenols were determined on GC-FID only). General and specific conclusions which may be drawn from these data are as follows:

1. The GC-FID raw data had more acceptable data points (non-rejected data). The principal reason for this was that the range of the data was narrower for GC-FID. This is also reflected in the GC-FID overall standard deviation which was 10 to 80% lower by GC-FID than by GC-EC.
2. The lower overall standard deviation experienced for GC-FID may be due to: (a) fewer procedural steps for FID than for EC procedure; (b) analysts greater familiarity with GC-FID than the derivatization GC-EC procedure; and (c) an inherent variability of the GC-EC procedure.
3. The mean recovery of the phenols using GC-FID was, in most cases, higher than GC-EC. This difference may again be due to the FID procedure and the analysts greater familiarity with nonderivatization techniques. The average mean recovery of the six concentrations and six water types for each compound compared well with data IT Enviroscience generated on distilled water and industrial effluents. These data are presented in Tables 26 and 27. The interlaboratory study data are therefore in the predicted range, and the percent recoveries for each compound do not appear to vary within the concentration levels used in the study.

TABLE 26. COMPARISON % RECOVERIES OF PHENOLS (GC-FID)

	IT Enviroscience % Recovery*	Interlaboratory % Recovery*
Phenol	41	41
2,4-Dimethylphenol	49	45
2-Chlorophenol	82	81
4-Chloro-3-methylphenol	90	74
2,4-Dichlorophenol	82	78
2,4,6-Trichlorophenol	84	87
Pentachlorophenol	85	83
2-Nitrophenol	80	80
4-Nitrophenol	46	44
4,6-Dinitro-2-methylphenol	85	86
2,4-Dinitrophenol	77	87

BEGIN
LAST LINE
OF TEXT

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

TABLE 27. COMPARISON % RECOVERIES OF PHENOLS
(PFBB DERIVATIVES-GC/EC)

	IT Enviroscience % Recovery*	Interlaboratory % Recovery*
Phenol	47	34
2,4-Dimethylphenol	44	49
2-Chlorophenol	66	58
4-Chloro-3-methylphenol	69	55
2,4-Dichlorophenol	60	71
2,4,6-Trichlorophenol	66	72
Pentachlorophenol	63	69
2-Nitrophenol	74	58
4-Nitrophenol	43	37

*Mean recovery expressed as percentage of true value of all concentrations and water types analyzed.

4. The percent relative deviation values of the GC-FID data overall were less than the GC-EC values. The GC-EC values ranged from one to two and one-half times the GC-FID percent relative deviations. This deviation reflects both the greater overall standard deviation and the lower mean recoveries seen in the GC-EC data.
5. The single-analyst standard deviation (SR) and percent relative deviation were less by GC-FID. The GC-EC values normally ranged from one to two times the GC-FID values.
6. As expected, the single-analyst standard deviation values were lower for both GC-FID and GC-EC than the corresponding relative standard deviation values. The single-analyst standard deviation values do show some random variation from compound to compound and by water type and concentration, but a pattern or trend was not detectable.
7. In measuring precision with the use of Youden pairs the values determined for a pair by an individual laboratory should be only slightly dissimilar. Both the GC-EC and GC-FID data show cases where the two concentrates comprising a Youden pair had mean recovery (X) differences reversed to the true values or with large differences. Examples of this are:

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND FIGURES

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

Wastewater No. 3

2-Chlorophenol (GC-FID)

True values $\mu\text{g/L}$	12.2	14.6
X $\mu\text{g/L}$	12.0	11.1

Pentachlorophenol (GC-FID)

True values $\mu\text{g/L}$	16.2	17.8
X $\mu\text{g/L}$	17.0	13.5

Wastewater No. 2

Phenol (GC-EC)

True values $\mu\text{g/L}$	101.0	91.2
X $\mu\text{g/L}$	27.4	47.2

Wastewater No. 2

2,4,6-Trichlorophenol (GC-EC)

True values $\mu\text{g/L}$	50.2	59.0
X $\mu\text{g/L}$	34.3	52.9

In reviewing the raw data, the only explanation for these differences is that a few laboratories made large random errors that were not rejected in the outlier test.

8. Several of the above differences were noted in both GC-EC and GC-FID results, e.g., in the GC-FID analysis of surface water for 2-nitrophenol, a medium concentration pair level was measured at 103 $\mu\text{g/L}$ and 130 $\mu\text{g/L}$ while the same sample by GC-EC was measured at 71 $\mu\text{g/L}$ and 99 $\mu\text{g/L}$ (true values 124 $\mu\text{g/L}$ and 150 $\mu\text{g/L}$). Since the differences were noted in both detection methods, and the detection methods results were in their normal ratio (GC-EC results less than the GC-FID), the loss of the compound in this case occurred in the sample prior to the analysis steps.
9. The statistical values for single-analyst standard deviation, overall standard deviation, and mean recovery on the low Youden pairs were not significantly different from the higher pairs. The method using GC-EC and GC-FID therefore may be utilized at the concentrations of the low Youden pair values with assurance.
10. A majority of laboratory Number 21's raw data by GC-EC for phenol and 2,4-dimethylphenol were statistically rejected. The corresponding GC-FID data were not rejected. The data for each compound were too low. Possible causes include improper standardization, misinterpretation of the chromatograms, and calculation errors.

11. A majority of laboratory Number 31's raw data by GC-FID for 4-chloro-3-methylphenol were statistically rejected. The corresponding GC-EC data

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

SEC/N
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

were not rejected. The data were too high. Possible causes include improper standardization and calculation errors.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

12. A majority of laboratory Number 91's raw data by GC-FID for phenol and 4-chloro-3-methylphenol by GC-EC were statistically rejected. The phenol data were too high and the 4-chloro-3-methylphenol data were too low. In each case the corresponding data from the other procedure were not rejected. The possible causes for the high phenol data include improper standardization and calculation errors. The low data for 4-chloro-3-methylphenol could have been caused by misinterpretation of the chromatograms.

13. A majority of laboratory Number 111's raw data by GC-EC for phenol, 2,4-dichlorophenol, and 4-nitrophenol were statistically rejected. The corresponding GC-FID data were not rejected. The GC-EC data were too low for phenol and 2,4-dichlorophenol, but too high for 4-nitrophenol. Among the possible causes for having both high and low results from the same extract would be 4-nitrophenol contamination, improper standardization, and misinterpretation of the chromatograms.

14. A majority of laboratory Number 131's raw data by GC-EC for 2-chlorophenol were statistically rejected. The corresponding GC-FID data were not rejected. The data were too low. Possible causes include improper standardization and calculation errors.

15. Laboratory Number 141 had all of its raw data by GC-FID and GC-EC statistically rejected for the compound 4-chloro-3-methylphenol. The data appeared to be high by a factor of ten, but review of the raw data submitted to IT Enviroscience could not confirm this apparent miscalculation. A majority of the data for pentachlorophenol by GC-EC were also statistically rejected.

16. A majority of laboratory Number 151's raw data by GC-FID for 2-chlorophenol, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol, pentachlorophenol, 2-nitrophenol, and 4-nitrophenol were statistically rejected. The majority of the corresponding GC-EC data was not rejected. The data for 2-chlorophenol were too high while the rejected data for the other compounds were all too low. The possible causes include improper standardization and calculation errors.

17. A majority of laboratory Number 181's raw data by GC-EC for 2,4,6-trichlorophenol, pentachlorophenol, 2-nitrophenol, 2,4-dimethylphenol, and 4-nitrophenol were statistically rejected. The corresponding GC-FID data were not rejected. The GC-EC raw data were too high due to either contamination, error in standard preparation, or calculation for a sample dilution not performed.

18. A majority of laboratory Number 221's raw data by GC-EC for 2,4-dichlorophenol were statistically rejected. The corresponding GC-FID data were not rejected. The data were too high. Possible causes include improper standardization, misinterpretation of the chromatograms, and contamination of the derivatized extracts.

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

Most of the laboratories noted above were asked to review data and procedures for errors in calculation or analytical techniques but none were reported back to IT Envirosience.

REVIEW OF PRECISION AND ACCURACY REGRESSION EQUATIONS

DROPPED
HEAD
BEGIN
SECTIONS
HERE

The linear regression equations for precision as S and SR versus the mean recovery are presented in Table 2 for FID and Table 3 for EC. The regression equations are by compound and water type. The slope of the line may be used to estimate the standard deviation data when the intercept is insignificant, i.e. <10% of the total value.

In the majority of the cases, the SR single-analyst standard deviation slope was less than the S overall standard deviation, as would be predicted. In the majority of cases, the intercept went through or approached the origin. There are several examples, however, where the intercept was a positive value greater than one signifying a systematic error affecting the precision. This effect can be quite a significant percentage at the lower concentrations. An example of the worst case of high numerical intercepts is pentachlorophenol in wastewater No. 1 by GC-FID where:

$$SR = 0.27X + 21.4$$

$$S = 0.32X + 23.4$$

9-1/8"

There were few negative intercepts greater than one, but the largest was with 4,6-dinitro-2-methylphenol in wastewater No. 2 by FID. This implies significant improvement in precision as the concentration decreases. The scatter of the data, however, makes calculation of an equation and subsequent interpretation of the data quite difficult for this compound in those water types.

The linear regression equations for mean recovery versus true concentration are presented in Table 2 for FID and Table 3 for EC. The regression equations are by compound and water type. Observation of the equations indicates that 100% recovery was not achieved for any of the compounds in any of the water types. The majority of the lines go through or approach the origin with the intercepts of less than one. Positive or negative intercepts greater than one were random through the water types.

The intercepts are significantly high and equate to concentrations that should have been found in the blanks if run at the same sensitivity as the low Youden pair. In reviewing the chromatograms it was learned that some laboratories did not run the blanks at the same sensitivity as the low Youden pair. This should be emphasized more in future studies.

COMPARISON ACROSS WATER TYPES

The multiplicative model (Equation 10) was fitted separately to the data for each compound in order to test for the effects due to water type. These analyses are summarized in Table 28. The detailed analysis of variance tables supporting these results is presented in Appendix A.

BEGIN
LAST LINE
OF TEXT

3/8"

73

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

TABLE 28. SUMMARY OF THE TESTS FOR THE DIFFERENCES ACROSS WATER TYPES

Compound	Observed F-Value	P(F >F OBS)	F-Test Statistically Significant at the 5% Level?	Significance Effect Established at the 95% Confidence Intervals?	Practical Significance Established	Water Types

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

Effect of Water type with FID Detector

DROPPED
HEAD-
BEGIN
SECTIONS
HERE

In most cases, there was no evidence of a statistically significant effect on accuracy or precision due to water type. In the cases of 2,4,6-trichlorophenol, pentachlorophenol, and 2,4-dinitrophenol, a statistically significant effect was established since $P(F > OBS) < 0.05$ and the simultaneous confidence intervals for one or both in $\ln \beta_j - b_j$ and $\gamma_j - \gamma_i$ for a particular water type(s) failed to cover zero.

In order to determine if these effects were of practical importance, Equations (15) and (16) were used to relate the mean recovery and precision of the compound in the significant water type to distilled water.

A summary of these results follows:

1. 2,4,6-Trichlorophenol - The mean recovery for water type 5 (wastewater 2) is estimated to range from 26.5 to 343% of the mean recovery for distilled water. Similarly, the standard deviation for water type 5 is estimated to range from 26.5 to 343% of the standard deviation for distilled water. In this case the magnitude of the percent recovery is concentration-dependent. These ranges are quite significant and may indicate an effect due to water type. However, examination of the regression equations for water type 5 indicates that the slope of S_r is significantly greater than S . Further examination of the raw data for water type 5 indicates that three data points of the low Youden pair averaged about 120 $\mu\text{g/L}$ compared to a true value of 23.6 $\mu\text{g/L}$. These three data points were not rejected by the outlier test and consequently were largely responsible for the significant effect of water type. Therefore it was judged that an effect of practical importance due to water type 5 was not established.
2. Pentachlorophenol - The mean recovery for water type 4 (wastewater 1) was estimated to range from 16 to 18% of the mean recovery for distilled water. In this case, the magnitude of the percent recovery is concentration-dependent. These ranges are quite significant and may indicate an effect due to water type. However, it should be remembered that water type 4 contained a significant amount of pentachlorophenol background, which resulted in a substantial positive bias in the low Youden pairs. Such a bias is reflected in large positive regression equation intercepts as compared to distilled water. Because this was considered an interference as opposed to a matrix effect, it was judged that an effect of practical importance due to water type 4 had not been established.
3. 2,4-Dinitrophenol - The mean recovery for water types 3, 5, and 6 were estimated to be 114 to 878, 101 to 876, and 118 to 969% of the mean recovery for distilled water, respectively. Similarly, the standard deviation for water types 3, 5, and 6 were estimated to be 114 to 876, 101 to 876, and 118 to 969% of the standard deviation for distilled water.

BEGIN
LAST LINE
OF TEXT

The estimates remain constant over the concentration ranges of the respective compounds. The ranges are quite large and may indicate a signi-

BOTTOM OF
IMAGE AREA.
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

ficant effect due to water type. Examination of the regression equation intercepts for 2,4-dinitrophenol in these water types indicates that they are significantly larger than distilled water. Further examination of the summary statistics in Table 28 indicates a significant positive bias, especially with the lower Youden pair, as compared to a substantial negative bias for distilled water. Examination of the chromatograms shows that 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol have retention times that are very close, and that the resolution of these compounds gets progressively worse with wastewaters. Thus, some of the analysts may have reported a partial contribution of the 4,6-dinitro-2-methylphenol peak to that of 2,4-dinitrophenol. Therefore, it was judged that an effect of practical importance due to water types had been established.

Effect of Water Type with the EC Detector

In most cases there was evidence of a statistically significant effect of water type for five compounds since $P(F > F_{OBS}) < 0.05$ was obtained; however, the simultaneous confidence intervals for $\ln \beta_j - \ln \beta_1$ and $\gamma_j - \gamma_1$ all included zero except for pentachlorophenol and 4-nitrophenol in water type 4. As indicated previously, water type 4 contained a large background level for pentachlorophenol; therefore, it was also judged that an effect of practical importance had not been established.

In the case of 4-nitrophenol, the mean recovery for water type 4 is between 7 and 1, 183% of that for distilled water, and is concentration-dependent ($j - 1 = 0$). The magnitude of this range is rather extensive and indicates the high variability of the data, which makes it difficult to ascertain any matrix effects of practical importance.

METHOD PROBLEMS AND RECOMMENDATIONS

In reviewing the reports, data sheet comments, and phone conversations of the participating laboratories, the following problems were noted with the method.

1. In the analysis of the phenols by FID, several of the laboratories on at least one occasion during the actual analyses had a problem with the SP-1240DA gas chromatography column separation, especially with the two dinitrophenols. This was not cured by changing the temperature or the temperature program rate. The best solution was to replace the column. (Acidifying the column with phosphoric acid does work.)
2. For each method of detection at least one laboratory had a problem in distinguishing between peaks in the standard mixture. The laboratories were advised to run individual standards to compare retention times. This step was not incorporated in the original method because the technique is considered part of good laboratory practice.
3. The laboratories were requested to use the method to analyze water blanks, making any corrections necessary to the spiked waters. In all cases except one, the backgrounds in the original wastewaters provided were less than 10% of the resultant spiked values, which was reflected

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA:
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

in most cases by the values reported for the blanks of the various waters. There was, however, one effluent sample (wastewater No. 1) which had approximately 300 ppb pentachlorophenol present in the unspiked sample as determined on several samples. It had been anticipated that this would drastically affect the compound's statistics on this sample, especially for the two lower Youden pairs. The data bear out that prediction. The majority of the laboratories reported background levels of pentachlorophenol (PCP) in wastewater No. 1 ranging from 20 to 500 µg/L. The remaining laboratories reported values ranging from detected by FID but not by EC, detected by EC but not by FID, to not detected by either FID or EC.

The reason for detection by FID and not by EC or vice versa is difficult to understand.

4. In the concentration steps after extraction, some laboratories had problems which included bumping of refluxing solvent and inability to concentrate rapidly or at all. The latter problem was traced to:
(a) improper operation of the Kuderna-Danish apparatus and hot water (steam) bath; (b) bath's incapability to maintain proper temperature, and (c) three-ball Snyder reflux columns with considerable column length above the top ball forcing the solvent vapor to reflux in the column and not dissipate out of the top. The problem of bumping was reported to be more frequent during the concentration step with 2-propanol present and required the full attention of the analyst. The use of a more volatile alcohol may reduce the bumping but still would require careful attention to avoid total loss of solvent during refluxing. The technique of using a more volatile alcohol with a small amount of higher boiling "keeper" alcohol may be worth pursuing to improve the concentration step. The continual attention of an analyst for any Kuderna-Danish concentration step is strongly recommended.
5. Several of the laboratories had problems in quantitation of the chromatographic peaks with the use of recording integrators. The integrators did not provide uniform peak area determination from sample to standard; for example, the samples, especially wastewaters, sometimes had peaks near the peak of interest that changed the integration start or stop point from that of the standard. Many laboratories achieved satisfactory results using peak height measurements for quantitation. A warning or precaution of this problem should be placed in the Method 604-Phenols in Section 4.6.

In future interlaboratory studies, very detailed instruction should be given to the participating laboratories to ensure labeling of each chromatogram. In this study it was very difficult to interpret much of the raw chromatographic data because of inadequate labeling. Other points to be emphasized in future studies are that: (a) blanks and spiked samples should be analyzed at the same sensitivity; and (b) calculations and record keeping should be uniform or consistent to aid in data interpretation.

The method includes a pre-extraction with methylene chloride at pH 12. IT Enviroscience has found this to be useful in removing interferences,

BEGIN
LAST LINE
OF TEXT

3/8"

77

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

especially those affecting the FID detection method. Even through some losses of phenols may occur during this extraction step, the benefits far outweigh those small losses.

IT Enviroscience also recommends that in applying the method, samples be screened by the GC-FID procedure, and if positive results are found, confirmation by the GC-EC procedure should be made.

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

6-1/2"

9-1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

78

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

REFERENCES

1. Code of Federal Regulations, 40: Part 136, October 16, 1973.
2. U.S. Code Congressional and Administrative News, 3, 1977, 95th Congress, First Session, 1977.
3. Youden, W. J., and E. M. Steiner, Statistical Manual of the Association of Official Analytical Chemists, editor/publisher, The Association of Official Analytical Chemists, Washington, DC 20011, p. 88, 1975.
4. Outler, E. C., and J.H. McCreery, Interlaboratory Method Validation Study Program Documentation, Battelle Columbus Laboratories, Columbus, Ohio, 1982. — 6-1/2" —
5. Thompson, W. R., Annals of Mathematical Statistics, Vol. 6, p. 214, 1935.
6. Draper, N. R. and H. Smith, Applied Regression Analysis, 2nd Edition, John Wiley and Sons, New York, 1981.
7. Bishop, T., F. Brylon, and E. C. Outler, Development of Statistical Technique to Compare Analytical Methods Across Wastewaters, Battelle Columbus Laboratories, Columbus, Ohio, 1982.

BEGIN
LAST LINE
OF TEXT

3/8"

79

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

APPENDIX A

TABLE A-1. PHENOLS IN 2-PROPANOL - RESULTS OF VERIFICATION AND STABILITY STUDY RESULTS IN mg/L

Compound	Amput 1			Amput 2		
	True Value	Day 0	Day 45	Day 0	Day 45	Day 90
2-Chlorophenol	7.3	7.3	7.4	6.1	6.0	5.7
2-Nitrophenol	12.5	12.3	12.7	15.0	15.2	14.9
Phenol	10.2	10.1	10.4	9.2	9.3	9.1
2,4-Dimethylphenol	6.5	6.3	6.6	7.5	7.7	7.0
2,4-Dichlorophenol	7.4	7.3	7.7	8.5	8.9	8.9
2,4,6-Trichlorophenol	10.2	10.0	10.4	11.8	12.2	11.9
4-Chloro-3-methylphenol	15.0	14.8	15.3	18.0	18.4	18.0
2,4-Dinitrophenol	16.0	15.7	16.7	13.5	10.7	11.2
4,6-Dinitro-2-methylphenol	14.9	14.1	12.8	16.8	19.3	13.7
Pentachlorophenol	8.9	8.6	9.1	8.1	8.0	8.1
4-Nitrophenol	14.1	13.9	13.9	16.0	16.0	16.6

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

TABLE A-2. PHENOLS IN 2-PROPANOL - RESULTS OF VERIFICATION AND STABILITY STUDY
RESULTS IN mg/L

Compound	Ampul 3			Ampul 5		
	True Value	Day 0	Day 45	Day 0	Day 45	Day 90
2-Chlorophenol	18.5	18.6	18.4	17.9	15.2	15.7
2-Nitrophenol	62.2	62.4	62.2	61.4	74.8	72.0
Phenol	50.6	50.3	50.6	50.4	45.6	44.0
2,4-Dimethylphenol	15.2	15.0	14.9	14.7	18.8	18.8
2,4-Dichlorophenol	55.8	55.1	51.5	53.3	64.3	60.4
2,4,6-Trichlorophenol	25.1	24.8	23.6	24.6	29.5	27.6
4-Chloro-3-methyl-phenol	74.9	74.2	80.9	74.0	89.8	85.4
2,4-Dinitrophenol	80.2	77.3	79.2	72.9	67.8	62.4
4,6-Dinitro-2-methyl-phenol	74.6	67.5	74.8	70.2	84.3	78.9
Pentachlorophenol	67.7	64.0	63.6	65.5	60.5	57.8
4-Nitrophenol	105	102	99.8	105	120	118

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

DROPPED
HEAD
BEGIN
SECTIONS
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

TABLE A-3. PHENOLS IN 2-PROPANOL - RESULTS OF VERIFICATION AND STABILITY STUDY RESULTS IN mg/L

Compound	Ampl 4			Ampl 6		
	True Value	Day 0	Day 45	Day 0	Day 45	Day 90
2-Chlorophenol	92.6	93.2	90.0	77.1	76.2	73.6
2-Nitrophenol	156	157	156	188	188	184
Phenol	126	127	127	116	114	113
2,4-Dimethylphenol	60.8	61.0	59.6	76.7	74.4	75.7
2,4-Dichlorophenol	93.1	93.9	91.6	109	105	105
2,4,6-Trichlorophenol	100	101	101	119	116	117
4-Chloro-3-methylphenol	187	188	187	229	227	223
2,4-Dinitrophenol	160	155	157	135	131	127
4,6-Dinitro-2-methylphenol	149	146	148	167	159	162
Pentachlorophenol	113	107	111	104	98.1	99.7
4-Nitrophenol	140	143	138	165	164	156

BEGIN
LAST LINE
OF TEXT

3/8"

82

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

TABLE A-4. CONFERENCE STUDY DATA SUMMARY - PHENOLS

Compound	FID (µg/L)				Ampl D			
	True Value	Mean Recovery	Std. Dev.	% Rel. Dev.	True Value	Mean Recovery	Std. Dev.	% Rel. Dev.
PhenoI	80.8	36.3	20.2	55.6	73.0	32.8	13.7	41.8
2-4-DimethylphenoI	48.6	27.4	11.7	42.7	60.2	34.5	17.5	50.7
2-ChlorophenoI	59.2	45.4	16.7	36.8	48.8	37.2	17.2	46.2
4-Chloro-3-methylphenoI	120	98.7	38.5	39.0	144	118	48.3	40.9
2,4-DichlorophenoI	44.6	39.5	18.6	47.1	51.4	43.7	18.8	43.0
2,4,6-TrichlorophenoI	80.4	63.5	24.7	38.9	94.6	72.0	38.1	52.9
PentachlorophenoI	54.2	42.6	19.4	45.5	48.4	38.6	13.8	37.1
2-NitrophenoI	99.6	74.1	32.6	44.0	120	86.0	50.6	58.8
4-NitrophenoI	112	58.7	23.7	40.4	128	70.8	28.7	40.5
4,6-Dinitro-2-methylphenoI	119	108	45.5	42.1	134	110	55.0	50.7
2,4-DinitrophenoI	128	85.4	30.6	35.8	108	83.4	39.7	47.6

Std. Dev. = Overall standard deviation.

% Rel. Dev. = % Relative deviation.

BEGIN
LAST LINE
OF TEXT

3/8"

83

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLER
AND ILLU-
STRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

TABLE A-4. (CONTINUED)

Compound	Ampl C				Ampl D			
	True Value	Mean Recovery	Std. Dev.	% Rel. Dev.	True Value	Mean Recovery	Std. Dev.	% Rel. Dev.
Phenol	80.8	39.6	32.9	83.1	73.0	33.6	19.4	57.7
2,4-Dimethylphenol	48.6	33.8	22.8	67.5	60.2	33.8	13.6	40.2
2-Chlorophenol	59.2	48.9	29.6	60.5	48.8	42.5	31.6	74.3
4-Chloro-3-methylphenol	120	90.5	59.0	65.2	144	121	74.2	61.3
2,4-Dichlorophenol	44.6	68.4	67.0	97.9	51.4	80.6	89.2	111
2,4,6-Trichlorophenol	80.4	70.1	41.6	59.4	94.6	75.3	53.3	70.8
Pentachlorophenol	54.2	38.4	17.9	46.6	48.4	46.4	23.2	50.0
2-Nitrophenol	99.6	79.7	64.5	80.9	120	104	91.8	88.3
4-Nitrophenol	112	69.9	46.6	66.7	128	93.0	71.0	76.3

Std. Dev. = Overall standard deviation.

% Rel. Dev. = % Relative deviation.

BEGIN
LAST LINE
OF TEXT

3/8"

84

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

TABLE A-5.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLISIFID

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 5	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	20.40	18.40	20.40	18.40	20.40	19.40	20.40	18.40	20.40	18.40	20.40	18.40
11	9.28	9.97	11.50*	11.50*	11.50*	11.50*	16.70*	15.00*	14.00	14.30	12.60	12.90
21	10.80	9.85	4.08	4.11	8.39	7.24	14.10	12.80	4.68	6.44	6.92	6.13
31	7.47	5.25	13.30	7.88	8.32	7.46	16.10	8.10	13.40	11.90	10.60	9.85
41	9.23	9.14	10.40	3.26	12.90	7.80	26.30*	22.40*	12.30	13.30	12.90	9.30
61	7.64	8.13	10.50	10.50	10.50	6.41	8.66	7.73	9.58	10.10	5.43	6.20
71	7.39	6.35	1.83	1.91	7.69	4.95	6.77	8.28	9.00	9.90	7.83	7.45
81	5.20	4.40	9.10	6.80	12.90	8.00	4.00	5.70	6.00*	3.30*	4.50*	3.90*
91	14.40*	15.67*	13.65*	12.90*	9.43	8.59	8.23	9.91	13.97*	14.94*	10.41*	10.44*
101	7.30	7.34	0.00*	8.37	5.55	6.11	10.60	3.36	0.00*	0.00*	10.50	3.36
111	9.40	7.50	7.91	3.90	6.10	8.80	10.10	7.90	10.80	10.00	9.20	7.90
121	9.87	9.14	9.56	9.12	9.12	9.41	9.89	9.89	13.30	7.53	7.78	7.61
131	12.00	8.61	12.40*	5.89	8.79	8.64	14.20	12.00	11.40	9.99	10.75	9.64
141	12.70	13.13	12.40*	7.92*	13.10*	9.84*	9.80	14.00	12.90	12.90	15.60*	12.20*
151	7.30*	2.80*	4.63*	2.60*	6.40*	3.80*	0.90*	2.50*	4.80	4.30	8.30	4.30
171	6.79	5.65	0.60*	0.00*	8.19	7.28	9.30	8.30	10.00	7.55	5.60*	5.14*
181	7.80	7.40	5.29	5.40	5.40	7.70	10.60	5.80	7.80	6.70	7.20	9.60
191	12.00	11.40	0.54	9.87	4.76*	6.75*	8.30	3.30	13.30	12.00	6.75	6.64
201	7.20*	4.00*	9.00	1.10	12.00*	9.00*	5.10	8.50	26.00*	45.00*	5.20	5.40
211	8.10	7.10	9.20	1.70	6.00	4.40	9.50	9.60	5.10	4.50	7.80	7.60
221					4.00	2.40*			9.10	7.50		

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-5. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	1	2
	20.40	18.40
LABORATORY NUMBER	9.43	8.58
	2.70	6.06
	•	•
	•	•
	7.53	8.95
	5.86	6.94
	•	•
	•	•
	•	•
	•	•
	7.02	6.80
	•	•
	•	•
	•	•
	•	•
	•	•
	5.78	7.54
	•	•
	16.20	14.00
	•	•
	•	•
	•	•
	•	•
	•	•

• • REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-6.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY—IT ENV PHENOLS:FID

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

MEDIUM YOU DEN PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20
11	44.70	46.00	*	*	56.90*	53.90*	82.20*	66.30*	57.60	49.70	54.40	38.70
21	13.90	46.30	32.30	32.20	18.60	39.10	17.80	36.50	26.90	26.20	21.50	32.50
31	34.90	39.50	40.80	39.40	26.10	34.00	12.50	56.20	17.20	41.30	0.00*	38.20
41	41.30	38.13	14.10	0.86	57.50	63.70*	58.30*	68.70*	52.60	61.70	59.80	53.30
61	33.90	35.60	*	*	40.70	52.20	51.30	44.00	49.40	53.00	30.70	34.30
71	28.30	38.80	26.20	31.00	30.00	35.70	27.20	41.80	36.70	42.80	37.20	32.20
81	91.90*	43.90	28.50	33.50	51.70	42.50	37.40	26.60	25.60*	25.80*	24.90*	16.20*
91	70.40*	88.10*	38.49*	98.98*	50.40	95.45*	55.93	125.23*	65.67*	108.11*	66.41*	98.54*
101	41.60	38.80	11.00	7.33	39.30	27.30	47.10	60.20	48.10	49.60	37.90	32.10
111	47.70	39.90	7.81	16.90	52.50	38.80	92.10	40.30	55.30	49.30	58.00	49.50
121	44.20	38.00	*	*	41.50	48.00	42.20	40.30	41.60	38.40	49.10	36.70
131	64.40	32.80	28.10	19.40	43.30	30.20	40.60	40.20	37.20	25.30	27.20	32.20
141	30.00	58.00	59.50*	54.00*	54.40*	52.50*	36.90	71.30	55.00	54.20	63.10*	48.80*
151	22.00*	32.00*	4.00*	5.00*	29.00*	14.00*	32.00*	26.00*	30.00	207.00*	18.00	16.00
171	37.80	34.60	3.22*	9.00*	34.90	41.10	35.10	41.10	37.80	38.30	20.60*	25.50*
181	41.20	45.40	8.80	15.10	44.20	38.50	56.00	54.50	47.40	43.50	42.40	48.40
191	53.30	53.30	33.00	40.00	32.30*	30.60*	38.70	30.20	59.30	33.60	38.30	45.50
201	88.00*	202.00*	64.00	73.00*	93.00*	30.60*	51.20	76.10	91.00*	138.00*	80.70	113.00*
211	41.50*	31.50*	7.90	5.30	37.40	43.50	28.50	31.50	7.50	38.40	25.00	18.90
221	43.20	35.40	41.10	14.80	46.40	35.50	43.00	33.70	44.30	40.70	39.00	35.70

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NOM DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-6. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FIO
 RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER	101.00	91.25
11	63.60*	64.60
21	37.40	31.90
31	*	*
41	*	*
51	37.60	19.00
71	37.10	43.50
81	*	*
91	*	*
101	*	*
111	*	*
121	40.90	44.20
131	*	*
141	*	*
151	*	*
171	28.60	33.90
181	*	*
191	32.10	71.70
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-7.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-17 ENV PHENOLS:FID

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	292.00	228.00	292.00	228.00	292.00	228.00	292.00	228.00	292.00	228.00	292.00	228.00
11	112.00	90.90	*	*	158.00*	128.00*	179.00*	145.00*	126.00	156.00	150.01	122.00
21	114.00	115.00	109.00	98.90	99.30	99.30	105.00	113.00	76.40	74.10	84.70	80.90
31	117.00	105.00	103.00	99.10	99.10	81.50	104.00	120.00	117.00	120.00	93.00	108.00
41	108.00	116.00	98.40	5.82	176.00*	151.00*	176.00*	133.00*	174.00	141.00	136.00	167.00*
61	98.30	96.00	*	*	121.00	99.70	137.00	129.00	116.00	114.00	73.30	80.80
71	74.70	85.10	14.00	44.80	44.80	84.00	90.50	85.70	97.80	76.60	98.80	80.70
91	116.00	104.00	119.00	75.70	91.90	80.20	62.80	80.70	56.50*	68.00*	51.00*	46.00*
101	236.56*	174.54*	201.55*	180.04*	195.44	183.43*	210.44	162.51	241.01*	184.11*	190.94*	110.99*
111	128.00	93.20	63.10	40.60	146.00	93.70	139.00	2.97	70.60	106.00	118.00	87.50
121	115.00	102.00	48.10	36.70	123.00	101.00	135.00	111.00	132.00	55.50	124.00	110.00
131	107.00	87.70	*	*	126.00	98.50	127.00	118.00	116.00	91.30	99.50	100.00
141	134.80	95.30	93.20	97.00	98.20	75.40	98.40	85.50	101.90	74.30	73.70	88.10
151	172.00	160.00*	170.00*	133.00*	164.00*	109.00*	101.00	190.00	158.00	90.30	217.00*	158.00*
161	51.00*	24.00*	0.00*	0.00*	42.00*	81.00*	61.00*	74.00*	62.00	98.00	41.00	106.00
171	104.00	96.50	16.50*	21.40*	67.80	102.00	87.80	86.70	109.00	68.20	50.90*	71.20*
181	72.00	103.00	26.40	76.80	92.90	106.00	135.00	114.00	61.00	106.60	124.00	82.20
191	138.00	136.00*	115.00	104.00	86.60*	68.90*	91.30	104.00	108.00	87.30	93.50	87.60
201	226.00*	416.00*	373.00*	191.00	86.60*	68.90*	91.30	104.00	108.00	87.30	93.50	87.60
211	97.90*	61.50*	32.30	23.00	108.30	95.00	111.00	83.50	87.50	80.40	76.60	90.00
221	116.50	94.30	102.10	82.40	112.40	80.70	117.00	102.10	114.00	100.60	112.20	86.30

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-7. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	4	7
HIGH YOUDEM PAIR TRUE VALUE UG/L	252.00	228.00
11	150.00	140.00
21	82.60	62.10
31	*	*
41	*	*
61	68.80	45.80
71	63.70	93.60
81	*	*
91	*	*
101	*	*
111	*	*
121	114.00	81.70
131	*	*
141	*	*
151	*	*
171	106.00	93.30
181	*	*
191	207.00	179.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-8.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 74

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
11	6.91	6.70	*	*	4.76	5.93	2.25	1.91	4.92	4.12	5.40	6.25
21	8.59	9.82	1.02	1.42	5.55	6.11	17.80*	18.00	3.82	6.23	4.26	0.32
31	9.70	7.58	3.10	0.89	8.46	10.30	5.30	2.84	5.29	7.03	8.17	5.17
41	9.77*	13.02*	5.88	1.03	410.00*	0.00*	10.00*	570.00*	8.51	282.00*	367.00*	5.60
61	4.78	7.65	*	*	6.18	4.75	1.94	2.88	4.02	1.55	1.26	3.84
71	5.22	5.30	*	*	5.88	7.35	9.71	6.39	6.61	6.48	12.60	8.35
81	4.80	7.33	5.30	2.30	15.10*	11.50	4.60	0.99	11.90*	8.80	4.50	3.90
91	2.47	3.15	4.36	6.35	6.55	6.45	5.55	6.41	8.43	8.96	8.24	5.11
101	6.67	8.03	0.00*	0.00*	4.16	5.77	2.37	2.65	0.00*	9.17	7.74	4.87
111	9.10	12.40	7.40	0.00*	6.50	7.30	8.09	2.90	5.00	7.81	2.11	3.90
121	10.20	11.47	*	*	8.04	4.17	9.73	5.78	3.96	6.12	8.70	9.71
131	8.54	6.59	0.00*	0.00*	8.05	8.93	2.97	3.73	3.95	4.54	2.58*	3.64*
141	4.12*	5.90*	3.55	2.07	0.81	0.97	2.17	0.43	2.96*	5.00	3.49	5.04
151	6.10*	3.00*	4.30	0.00*	2.60*	2.10*	0.90	1.70	4.50	5.00	3.80	3.70
171	4.70	5.27	0.00*	0.00*	5.95	8.48	6.90	6.30	4.03	1.89	3.30	2.31
181	7.20	7.85	0.60	0.40	9.70	9.20	7.70	17.50	2.82	6.90	6.40	8.90
191	9.49*	10.50*	1.78	3.49	3.74	4.78	5.28	6.00	5.95	7.87	5.29	6.55
201	*	*	14.00*	19.00*	11.10*	11.00*	*	*	17.00*	15.00*	*	*
211	6.10	4.50	2.70	1.00	4.50	4.50	1.60*	1.50*	5.00	2.60	5.30	7.60
221	5.80	7.60	4.00	4.70	3.00	5.70	5.90	5.60	1.90	2.60	3.80	4.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NOW DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-8. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER	
	1	2
	13.00	15.20
LABORATORY NUMBER		
11	2.65	2.25
21	2.39	7.24
31	*	*
41	*	*
61	5.46	4.94
71	5.69	5.69
81	*	*
91	*	*
101	*	*
111	*	*
121	7.37	8.67
131	*	*
141	*	*
151	*	*
161	4.76	5.11
171	*	*
181	9.57	9.74
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-9.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS*FID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUDEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	30.40	37.60	10.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60
11	18.30	27.80	*	12.40	13.90	19.40	29.90	15.20	10.60	19.90	14.70	
21	5.98	30.80	3.18	13.60	16.17	18.80	15.30	29.40	6.45	7.37	9.09	0.25
31	17.00	21.60	2.41	6.57	18.60	24.00	1.09	25.00	5.80	15.00	24.90	
41	25.60*	33.90*	7.97	5.57	0.00*	539.00*	22.60*	24.10*	10.40	25.70	21.80	18.40
61	14.30	21.00	*	11.30	21.60	12.80	7.60	5.54	8.08	5.00	0.68	
71	13.70	23.50	3.47	15.90	16.20	19.10	15.60	13.20	13.20	20.40	4.10	
81	27.20	20.40	1.30	6.10	26.30	21.90	22.90	19.00	22.40	17.30	15.20	
91	15.40	42.85*	25.40	26.42	18.40	42.32*	43.81*	32.84	11.08	95.44*	31.48	53.61
101	17.90	24.80	0.00*	0.00*	12.00	12.00	10.10	10.60	15.00	18.90	1.21	20.90
111	14.50	21.00	0.00*	0.00*	13.80	17.70	10.90	0.00*	14.30	23.00	0.00*	10.10
121	20.30	25.00	*	15.50	23.80	16.80	18.00	18.30	21.80	25.60	21.10	
131	16.80	13.10	0.00*	14.10	18.90	6.83	9.38	0.00*	0.00*	0.00*	0.00*	
141	4.94*	13.20*	6.97	9.50	2.58	3.87	1.11	11.10	2.90*	5.40	10.40	
151	11.00*	18.00*	26.00	4.50	8.00*	6.00*	12.00	17.00	11.00	59.00*	6.00	3.90
171	13.83	18.83	0.00*	0.00*	19.30	21.90	13.30	18.20	5.95	10.40	10.00	
181	17.30	28.10	29.47	3.10	23.60	28.20	21.30	29.90	13.60	21.00	13.00	30.40
191	21.60*	30.00*	8.34	14.30	16.30	22.40	16.80	17.20	13.90	10.50	18.90	20.60
201	8.00	53.00*	71.00*	63.00*	43.30*	45.00*	34.00*	32.00*	87.00*	10.00	57.60	
211	16.50	16.50	*	12.40	26.40	1.00*	9.20	3.00	6.90	6.10	11.80	
221	17.50	19.60	12.00	18.10	11.70	13.70	8.60	9.80	6.90	10.50		

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-9. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:PID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	3	5
11	12.30	28.00
21	17.90	47.40
31	*	*
41	*	*
61	15.80	14.50
71	15.50	23.50
81	*	*
91	*	*
101	*	*
111	*	*
121	19.40	26.90
131	*	*
141	*	*
151	*	*
171	11.60	20.00
181	*	*
191	17.70	29.80
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-10.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLISIFID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	85.90	114.60		*	74.80	96.40	119.00	116.00	60.50	87.80	71.50	89.20
21	85.30	112.00	46.60	86.20	56.40	73.70	73.30	110.00	29.90	48.00	0.28	68.50
31	94.60	113.00	45.40	73.40	84.10	99.70	93.70	104.00	54.50	89.70	55.50	87.80
41	109.00*	153.00*	44.70	35.80	40.10	0.00*	221.00*	115.00*	105.00	107.00	2.14	133.00
61	95.40	79.00		*	67.80	60.00	54.30	40.80	26.90	28.50	58.30	39.30
71	61.50	94.30		*	27.40	70.50	57.20	64.10	57.30	54.00	74.90	120.00
81	92.00	51.60	83.80	79.40	77.00	104.00	56.10	112.00	72.30	100.00	44.50	77.10
91	128.82*	35.85	39.44	150.12	86.45	99.83	84.19	45.97	66.83	89.36	36.72	105.43
101	96.43	98.20	4.57	4.57	69.70	27.80	32.20	50.00	55.40	83.90	84.80	85.70
111	63.20	52.80	0.00*	0.00*	56.40	49.50	51.30	0.00*	50.00	0.00*	58.90	79.00
121	81.40	93.80		*	89.60	78.20	66.80	106.00	76.40	92.00	70.30	
131	69.10	68.20	16.20	32.90	66.00	83.50	24.70	45.50	50.40	29.00	32.80*	0.00*
141	46.00*	69.60*	37.10	51.10	206.00*	19.30	23.60	63.80	30.40*	22.10*	56.10	55.70
151	38.00*	18.00*	2.00	2.00	21.00*	36.00*	44.00	39.00	41.00	49.00	21.00	8.00
161	63.50	83.50	0.00*	0.00*	50.80	110.00	45.60	68.40	38.30	36.40	10.50	94.20
181	82.20	129.00	16.10	65.20	67.30	125.00	96.30	105.00	61.20	67.00	96.00	94.40
191	96.50*	132.00*	72.00	89.30	75.70	83.70	60.90	92.30	31.00	60.80	66.40	87.30
201	67.00	175.00	210.00*	207.00*		*	225.00*	298.00*	32.00*	256.00*	308.00*	393.00*
211	62.50	66.60	1.00	1.50	77.60	115.50	27.50*	44.60*	14.50	20.80	10.50	45.10
221	72.70	88.70	71.20	55.00	68.20	52.90	47.00	45.70	25.70	37.70	48.00	66.30

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NOM DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-10. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 7	
	4	6
11	122.00	151.00
21	43.60	34.60
31	81.90	71.60
41	*	*
61	*	*
71	84.20	54.50
81	49.30	107.00
91	*	*
101	*	*
111	*	*
121	94.00	96.90
131	*	*
141	*	*
151	*	*
171	67.40	118.00
181	*	*
191	100.00*	120.00*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-11.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V 50 PAGE 124

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFIDF

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNGEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
14.60	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20
13.90	9.01	9.01	16.50	12.50	12.50	13.90	16.70	13.90	18.30	19.80*	19.90	18.50
11.00	9.31	9.65	7.91*	6.12*	6.12*	9.95	11.20	9.95	4.31*	6.45*	9.06	6.38
13.10	9.11	13.20	8.97	12.30	9.90	9.20	16.10	9.20	12.70	10.60	12.60	9.59
14.00	12.50	14.70	12.60	14.80	9.57	13.00	17.00	17.00	14.80*	10.60*	15.70*	11.10*
6.93	32.80*	14.70	9.55	6.35	6.35	9.56	9.56	4.95	8.21	7.50	5.39	5.13
10.93	7.75	1.13	2.49	10.20	8.11	7.50	7.74	7.74	6.49	8.58	9.74	7.83
5.50	4.40	11.40	10.90	9.40	11.40	6.50	6.55	6.55	9.10	6.30	6.50*	3.20*
4.45	7.45	3.33	29.45*	2.90*	6.51*	8.37	3.85	8.37	5.19	7.42	6.23	26.41
10.20	5.70	9.95	9.15	11.90	7.98	12.70	4.41	0.00*	0.00*	0.00*	12.70	8.55
11.10	14.30	10.80	12.10	12.40	11.30	14.20	7.50	12.30	12.40	14.10	14.10	8.80
13.70	10.10	12.10	11.80	10.90	10.90	11.40	7.93	11.90	12.40	10.80	10.80	9.75
13.70	8.84	30.70*	18.70	9.93	6.00*	0.00*	0.00*	0.00*	11.90	8.59	10.80	9.75
15.20	13.00	16.30	16.10	12.60	12.60	2.30	14.10	13.50	11.40	9.20	7.82	3.31
10.70*	3.00*	6.70	11.20	5.40*	4.00*	1.00*	4.00*	6.70	5.00	5.00	16.00	11.70
9.16	9.02	16.20	13.70	11.80	10.30	10.80	10.80	12.80	9.70	10.70	10.70	7.60
12.70	9.40	87.50*	72.00*	13.00	10.20	16.70	19.00	11.10	12.80	9.70	11.00	13.20
11.70	9.60	11.30	8.78	6.55	9.62	9.25	6.65	12.90	12.90	9.40	9.07	7.42
201	*	13.30	4.80	13.30	4.80	*	24.00*	24.00*	15.40	15.40	*	*
14.70	6.50	15.40	2.80	13.20	7.70	13.80	20.90	20.90	8.80	7.20	11.20	20.80
35.90*	28.90*	39.50*	40.83*	14.00	34.40*	30.30*	22.80	22.80	29.20*	25.50*	29.60*	27.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-11. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
 RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER		
11	17.20*	13.00*
21	3.30	6.80
31	*	*
41	*	*
61	5.27	30.90*
71	9.81	8.22
81	*	*
91	*	*
101	*	*
111	*	*
121	9.54	8.34
131	*	*
141	*	*
151	*	*
171	8.36	10.10
181	*	*
191	11.70	8.29
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-12.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS/FID

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUDEY PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	3	5	3	5	3	5	3	5	3	5	3	5
11	31.80	28.80	*	*	33.00	29.30	43.30	27.50	37.50	25.50	34.60	21.70
21	7.14	23.40	17.60	23.00	8.91*	17.80*	10.50	24.60	18.40*	13.98*	12.40	19.90
31	26.80	28.00	29.30	26.00	18.80	22.80	9.10	31.20	8.55	23.90	2.70	24.70
41	32.50	30.10	75.70	58.80	35.50	32.80	29.60	33.50	37.70*	34.90*	40.30*	34.80*
61	15.40	14.20	*	*	15.50	22.70	41.90	15.40	20.70	18.20	15.50	26.40
71	21.80	27.75	15.60	169.00*	27.40	23.50	18.50	25.20	20.00	26.60	25.70	20.90
81	26.60	21.83	40.50	33.50	30.40	21.40	23.50	19.20	19.00	17.10	19.00*	11.50*
91	11.59	94.55*	15.31	79.54	15.48	69.96*	13.51	75.43*	16.03	68.34*	15.98	72.18*
101	26.10	24.10	42.70	66.70	28.10	21.10	32.10	0.00*	29.10	24.10	27.10	24.10
111	35.50	27.80	77.20	69.30	38.80	26.70	36.80	41.30	37.30	33.80	41.20	28.70
121	29.50	24.40	*	*	28.70	27.60	28.10	25.20	27.90	22.30	33.70	22.70
131	38.80	23.40	37.10	25.20	28.60	24.80	9.60*	2.50*	18.20	15.50	15.00	15.50
141	16.10	33.60	32.60	29.60	39.10*	32.80*	29.40	38.30	28.30	28.00	33.10	25.50
151	19.00*	20.00*	31.00	41.00	34.00*	15.00*	19.00*	18.00*	22.00	145.00*	11.00*	10.00*
171	28.40	27.80	58.20	66.00	33.40	33.90	23.70	23.90	25.60	23.70	27.00	20.00
181	34.30	38.60	109.40	38.00	37.00	26.10	48.40	31.30	34.80	28.50	35.00	31.30
191	26.40	23.60	24.20	24.30	22.30	15.90	23.20	18.50	35.80	15.40	27.30	27.20
201	28.20	59.50*	72.20*	80.40*	60.20	*	68.70*	45.30*	95.90	103.00*	10.70	55.90*
211	34.70	25.90	4.50	37.60	37.90	38.50	34.10	33.00	5.50	31.30	21.40	19.10
221	54.70	27.50	59.40	28.50	58.90	25.30	32.40	20.70	42.40	24.90	34.10	24.40

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-12. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFIO

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
	37.00	30.40
LABORATORY NUMBER		
11	41.00*	57.50*
21	24.10	19.50
31	*	*
41	*	*
61	18.60	23.70
71	29.30	28.70
81	*	*
91	*	*
101	*	*
111	*	*
121	30.10	27.90
131	*	*
141	*	*
151	*	*
171	19.40	22.10
181	*	*
191	22.30	23.20
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-13.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	144.00	108.00	*	179.00	126.00	193.00	128.00	134.00	179.00*	177.00	148.00	148.00
21	134.00	121.00	115.00	138.00	109.00*	111.00	133.00	94.80*	87.30*	115.00	89.90	89.90
31	174.00	131.00	184.00	125.00	145.00	112.00	174.00	128.00	138.00	126.00	127.00	127.00
41	175.00	138.00	249.00	262.00	206.00	170.00	198.00	190.00	170.00*	170.00*	187.00*	187.00*
61	101.00	82.00	*	114.00	89.80	170.00	90.80	107.00	106.10	95.60	75.00	75.00
71	116.00	118.00	19.70	144.00	67.80	112.00	123.00	99.20	135.00	96.00	151.00	99.60
81	129.70	114.00	130.03	91.40	100.00	91.50	106.00	112.00	85.30	86.30*	65.90*	65.90*
91	144.14	127.95	129.64	126.11	103.28	115.43	108.03	131.05	108.12	122.34	152.09	152.09
101	169.00	108.00	227.00	184.00	166.00	118.00	160.00	0.00*	123.00	132.00	104.00	104.00
111	183.00	136.00	289.00	112.00	181.00	69.10	185.00	143.00	109.00	180.00	146.00	146.00
121	151.00	110.00	*	168.00	114.00	171.00	133.00	132.00	116.00	138.00	119.00	119.00
131	188.40	109.50	147.20	149.00	144.90	117.40	111.40*	89.70*	129.90	91.10	109.50	109.50
141	195.00	145.00*	214.00	159.00	257.00*	131.00*	217.00	171.00	175.00	214.00	154.00	154.00
151	84.00*	21.00*	133.00	73.00	76.00*	65.00*	34.00*	47.00*	100.00	95.00*	58.00*	58.00*
171	115.00	121.00	236.00	248.00	115.00	144.00	117.00	107.00	72.00	71.60	110.00	110.00
181	139.00	140.00	54.10	185.30	156.00	135.00	165.00	141.00	144.00	170.00	111.60	111.60
191	137.00	119.00	136.00	103.00	121.00	90.00	103.00	111.00	132.00	130.00	98.70	98.70
201	175.00	280.00*	499.00*	267.00*	*	370.00*	388.00*	51.60	273.00*	486.00*	465.00*	465.00*
211	162.10	96.30	110.00	168.00	231.00	152.40	191.40	132.10	154.00	119.20	157.10	157.10
221	164.80	133.80	153.20	142.40	167.30	149.50	176.80	134.40	164.00	135.00	173.60	173.60

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-13. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER		
11	182.00*	169.00*
21	109.00	69.00
31	*	*
41	*	*
61	60.30	88.20
71	103.00	132.00
81	*	*
91	*	*
101	*	*
111	*	*
121	168.00	105.00
131	*	*
141	*	*
151	*	*
171	156.00	116.00
181	*	*
191	193.00	125.00
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-14.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLSFIDIO

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
11	30.00	36.00	30.00	35.00	30.00	36.00	30.00	36.00	30.00	36.00	30.00	36.00
21	24.60	24.60	*	*	30.80	37.90	20.80	28.80	43.70	39.80	21.70	31.60
31	29.50	31.20	19.50	23.50	21.80	24.00	27.30	32.00	16.30*	20.10*	24.00	24.20
41	62.00*	36.00*	136.00*	111.00*	74.30*	93.60*	53.90*	40.30	89.30*	100.00*	77.10*	82.10*
51	28.40	37.10	25.60	14.70	702.00*	27.90	39.80	53.30	33.10*	49.10*	36.70	35.80
61	21.80	22.20	*	*	19.00	19.70	15.10	19.90	20.20	25.20	19.70	25.60
71	23.00	24.30	1.40*	1.52*	28.20	33.50	15.80	43.50	28.00	24.20	24.10	27.40
81	12.70	13.10	18.10	21.70	23.10	37.00	12.60	20.40	32.70	19.50	7.50	8.70
91	18.98	27.39	15.41	20.11	11.23	21.84	10.88	17.36	13.99	20.96	6.46	21.09
101	23.10	20.20	2.97	11.90	24.20	29.70	23.60	16.10	1.19	0.00*	28.60	25.00
111	29.30	34.00	24.90	2.20	25.50	33.20	26.20	18.40	23.80	31.50	18.40	25.90
121	29.10	31.00	*	*	27.60	57.60	30.30	31.90	25.40	27.20	22.10	23.40
131	35.60	32.90	27.10	26.30	30.10	36.00	14.50	65.70	24.90	25.60	16.80	15.50
141	180.00*	242.00*	147.00*	193.00*	188.00*	289.00*	225.00*	188.00*	182.00*	201.00*	223.00*	251.00*
151	17.70*	9.00*	0.50*	0.00*	11.70*	16.40*	7.30*	2.20*	15.40	18.70	11.90*	3.80*
161	26.70	22.40	3.90	4.90	24.00	32.40	19.60	19.00	23.30	26.50	16.70	22.00
171	26.50	29.40	12.20	14.00	24.70	31.30	24.30	14.90	16.90	33.30	4.70	29.30
181	27.30	32.70	13.60	8.20	11.90	24.10	18.60	23.80	27.80	40.10	17.60	22.60
191	28.80*	22.80*	43.00	45.80*	*	63.10*	*	*	78.00*	49.00	*	*
201	24.90	29.00	10.50	14.00	26.30	26.20	16.40	32.90	17.50	4.60	23.00	32.20
211			25.90	14.00	7.60	4.50	26.50	32.10	23.00	26.98	22.30	26.20
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-14. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER	30.00	36.00
11	27.10*	29.10*
21	8.42	22.80
31	*	*
41	*	*
61	11.10*	7.64*
71	21.30	25.00
91	*	*
101	*	*
111	*	*
121	20.70	26.70
131	*	*
141	*	*
151	*	*
171	17.30	30.90
181	*	*
191	24.50	26.50
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIFID

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	146.00	194.00	*		146.00	173.00	239.00*	260.00	162.00	176.00	170.00	151.00
21	38.20*	166.00	80.10	154.00	146.00	132.00	45.00	119.00	80.20*	90.60*	61.80	101.00
31	157.00*	219.00*	242.00*	297.00*	172.00*	253.00*	56.50	272.00	113.00	248.00	183.00	321.00*
41	147.00	182.00	43.50	8.57	139.00	103.00*	390.00*	203.00	729.00*	260.00*	198.00	190.00
61	139.00	147.00	*		86.70	107.00	93.40	115.00	93.40	112.00	95.40	100.00
71	100.00	157.00	1.24*	32.70*	135.00	173.00	98.60	184.00	139.00	121.00	113.00	136.00
81	135.00	125.00	76.20	109.00	145.00	125.00	107.00	105.00	95.50	116.00	85.00	95.00
91	95.16	151.99	88.82	129.42	65.11	135.89	68.41	138.26	01.82	129.91	72.31	145.87
101	130.00	177.00	54.80	54.80	121.00	125.00	146.00	14.80	142.00	173.00	111.00	85.80
111	144.00	164.00	34.10	43.20	148.00	147.00	97.70	0.00*	139.00	166.00	164.00	164.00
121	121.00	156.00	*		120.00	140.00	125.00	159.00	123.00	145.00	137.00	165.00
131	147.30	142.10	107.00	109.20	135.90	161.20	143.40	144.10	116.50	117.50	99.20	123.40
141	718.00*	400.00*	725.00*	817.00*	200.00*	380.00*	627.00*	4150.00*	660.00*	150.00*	737.00*	4010.00*
151	81.00*	105.00*	24.00*	13.00*	107.00*	59.00*	102.00*	97.00*	85.00	206.00	97.00*	72.00*
171	118.00	144.00	21.90	96.90	124.00	184.00	80.30	130.00	109.00	70.00	110.00	116.00
181	121.40	169.00	102.90	108.40	130.00	150.40	126.00	196.00	122.00	177.00	108.90	153.30
191	123.00	166.00	77.70	103.00	86.60	127.00	117.00	127.00	144.00	121.00	122.00	163.00
201	149.00	448.00*	57.00	91.00	294.00*	*	335.00*	309.00*	272.00*	455.00*	469.00*	469.00*
211	147.00	150.50	9.10	18.43	148.40	228.90	50.20	92.40	20.30*	178.70	80.60	136.30
221	136.20	148.50	112.30	45.10	124.10	135.60	126.40	142.60	121.30	136.70	120.20	146.70

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-15. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS/FIO

844 DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER	150.00	180.00
11	169.00*	224.00*
21	110.00	131.00
31	*	*
41	*	*
61	53.30*	29.20*
71	109.00	157.00
81	*	*
91	*	*
101	*	*
111	*	*
121	131.00	173.00
131	*	*
141	*	*
151	*	*
171	92.00	161.00
181	*	*
191	98.40	140.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-16.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00
11	435.00	540.00	*	*	476.00	533.00	636.00	673.00	396.00	669.00	515.00	643.00
21	251.00	231.00	270.00	249.00	289.00	289.00	237.00	412.00	190.00*	278.00*	188.00	246.00
31	523.00*	581.00*	532.00*	641.00*	583.00*	583.00*	568.00	631.00	493.00	659.00	466.00*	675.00*
41	396.00	526.00	110.00	47.10	430.00*	250.00*	440.00	513.00	524.00*	939.00*	342.00	586.00
61	191.00	267.00	*	*	282.00	257.00	324.00	293.00	246.00	280.00	136.00	243.00
71	245.00	353.00	24.70*	50.80*	143.00	369.00	282.00	334.00	296.00	289.00	309.00	315.00
81	284.00	345.00	286.00	250.00	176.00	284.00	210.00	300.00	217.00	257.00	263.00	196.00
91	299.01	316.49	208.73	242.82	228.82	293.55	292.43	292.01	203.96	235.58	281.68	287.15
101	400.00	387.00	242.00	220.00	391.00	362.00	344.00	44.80	256.00	422.00	362.00	384.00
111	352.00	402.00	160.00	169.00	341.00	401.00	334.00	1.41	327.00	111.00	299.00	427.00
121	326.00	326.00	*	*	375.00	362.00	349.00	417.00	337.00	388.00	310.00	421.00
131	349.90	363.60	306.90	345.30	316.50	370.00	294.00	363.20	331.30	189.70	200.70	351.80
141	*780.00*	*120.00*	*724.00*	*890.00*	*360.00*	*280.00*	*810.00*	*260.00*	*514.00*	*900.00*	*130.00*	*950.00*
151	157.00*	72.00*	25.00*	27.00*	117.00*	159.00*	190.00*	150.00*	173.00	201.00	137.00*	175.00*
171	323.00	381.00	92.50	131.00	230.00	494.00	215.00	281.00	284.00	250.00	197.00	250.00
181	300.00	437.00	106.40	405.40	261.00	337.00	396.00	420.00	350.40	375.80	369.30	335.30
191	334.00	443.00	260.00	333.00	253.00	307.00	275.00	377.00	281.00	321.00	295.00	363.00
201	350.00	844.00*	690.00*	907.00	*	*	*140.00*	*260.00*	253.00	867.00	981.00*	*280.00*
211	322.00	278.60	129.90	178.50	419.30	446.60	295.40	321.30	280.00	311.10	266.70	218.40
221	325.30	398.00	329.60	268.20	341.30	284.00	336.60	383.80	249.00	364.30	326.10	359.50

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-16. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSIFID

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNGER PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER		
11	374.00	450.00
21	404.00*	361.00*
31	246.00	255.00
41	•	•
61	88.50*	78.00*
71	193.00	396.00
81	•	•
91	•	•
101	•	•
111	•	•
121	351.00	334.00
131	•	•
141	•	•
151	•	•
171	352.00	461.00
181	•	•
191	306.00	340.00
201	•	•
211	•	•
221	•	•

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-17.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENDLS:PID

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUDEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00
11	10.90	11.00	*	*	11.90	14.60	11.80	15.00	18.00	16.00	15.70	15.90
21	13.50	16.90	12.40	15.10	9.85	10.60	24.40	26.60	4.33	11.80	15.70	14.50
31	13.40	13.70	21.30*	14.50	13.20	16.00	18.90	15.40	25.30*	22.90	19.90	21.80
41	8.82	16.10	44.40*	23.10*	0.00*	40.10*	8.16	0.00*	4.32	0.00*	0.00*	0.00*
51	6.65*	10.10*	*	*	9.35	8.72	8.37	9.49	9.30	11.80	7.43	10.70
61	12.30	13.70	10.30	9.78	14.40	16.10	6.19	13.70	14.50	12.50	13.10	16.10
71	7.50	9.20	11.80	12.70	10.80	14.40	7.40	10.60	10.00	1.80	5.80*	4.20*
81	11.87	15.87	8.95	12.54	9.08	12.76	7.93	12.11	9.98	12.84	10.19	10.48
91	10.50	9.25	12.90	15.20	11.80	13.50	11.80	9.18	3.67	0.00*	13.60	13.80
101	16.00	14.00	13.70	11.10	12.70	12.10	16.10	5.70	9.80	12.00	8.40	9.20
111	14.80	15.70	*	*	12.10	17.00	12.60	12.30	10.30	14.50	12.20	15.70
121	18.60	16.20	13.40	15.00	16.40	18.90	12.90	18.30	10.20	11.20	9.72	9.28
131	131	16.80	8.77	7.09	16.30	18.70	17.50	9.60	10.40	13.10	15.80	13.50
141	8.82	16.80	2.70*	5.90*	6.70*	7.20*	2.00*	3.30*	7.00	9.20	1.80*	7.90*
151	11.40*	4.65*	11.30	16.10	13.10	16.70	13.00	13.50	12.10	14.20	10.30	13.80
161	10.60	11.65	11.60	13.00	13.50	13.30	15.40	20.90	9.46	14.80	12.40	22.40
171	13.20	15.00	12.60	13.00	7.14	15.00	11.30	12.60	13.20	21.40	10.20	12.70
181	13.30	15.70	30.00*	37.00*	28.00*	28.00*	11.70	23.40	46.00*	43.00*	19.50	25.30
191	19.90	16.30	5.20*	13.70	16.30	16.30	11.70	23.40	13.70	16.30	19.50	25.30
201	11.50	14.20	11.40	11.20	9.00	9.00	9.60	16.10	11.80	12.50	12.60	12.70
211												
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-17. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER	
	1	2
	14.80	17.00
LABORATORY NUMBER	11.10	15.00
	4.17*	12.30
21		*
31		*
41		*
61	7.60*	11.90*
71	12.10	14.40
81	*	*
91	*	*
101	*	*
111		*
121	10.30	12.60
131	*	*
141	*	*
151	*	*
171	9.56	15.20
181		*
191	12.70	13.50
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-18.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE		WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
MEDIUM YOUNG PAIR	TRUE VALUE UG/L	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER		112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00
11	95.80	119.00	*	82.00	91.80	121.00	107.00	105.00	95.70	103.00	69.50		
21	29.70	124.00	63.00	37.50	95.40	51.30	116.00	74.40	74.50	56.50	115.00		
31	76.50	112.00	87.70	59.20	95.40	26.70	127.00	32.40	97.00	2.91	108.00		
41	97.00	129.00	121.00	165.00	257.00	165.00	212.00	125.00	200.00	72.00	176.00		
61	53.60	77.90	*	60.00	87.80	76.60	61.10	62.90	76.90	51.60	76.70		
71	78.80	127.00	79.40	154.00	99.90	119.00	118.00	105.00	96.80	91.70	103.00		
81	133.00	99.50	95.40	89.30	87.90	84.40	83.90	66.00	70.50	67.90	56.00		
91	80.63	122.31	62.11	99.57	60.54	110.64	108.91	62.14	88.89	70.15	94.39		
101	83.60	113.00	82.60	110.00	84.30	104.00	20.20	102.00	121.00	85.10	105.00		
111	66.60	103.00	63.80	105.00	73.60	95.40	70.30	56.60	120.00	0.00	92.20		
121	85.30	99.50	*	80.70	111.00	77.50	101.00	74.70	96.70	98.40	85.40		
131	100.70	100.90	81.10	96.60	108.90	78.70	86.10	64.20	71.60	40.70	73.70		
141	50.00	76.00	61.00	111.00	123.00	70.80	118.00	63.50	93.70	79.70	89.90		
151	59.00	85.00	35.00	0.00	64.00	63.00	75.00	359.00	36.00	36.00	44.00		
171	92.50	116.00	61.80	107.00	83.50	124.00	108.00	82.00	51.10	77.10	81.80		
181	19.80	117.00	32.90	103.00	26.20	101.90	130.00	13.20	113.60	15.00	123.40		
191	80.50	105.00	72.90	91.00	73.00	90.10	93.50	109.00	87.70	90.70	114.00		
201	115.00	348.00	256.00	234.00	247.00	247.00	168.00	211.00	301.00	260.00	338.00		
211	125.50	123.50	20.80	94.40	125.50	195.00	126.00	23.40	155.30	80.90	95.20		
221	98.40	105.30	92.00	105.40	103.60	94.70	88.70	93.90	104.70	91.60	105.60		

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-18. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS/FID

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	3	5
LABORATORY NUMBER		
11	98.80	77.30
21	97.60	50.50
31	*	*
41	*	*
61	59.20*	61.50*
71	93.60	132.00
81	*	*
91	*	*
101	*	*
111	*	*
121	87.50	112.00
131	*	*
141	*	*
151	*	*
171	66.10	101.00
181	*	*
191	65.90	90.90
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-19.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:PID

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	160.00	179.00	*	*	173.00	180.00	213.00	178.00	193.00	248.00	184.00	219.00
21	157.00	203.00	146.50	246.00	125.00	139.00	147.00	164.00	112.00	136.00	167.00	135.00
31	196.00	196.00	151.00	177.00	150.00	613.00*	187.00	184.00	145.00	190.00	125.00	184.00
41	302.00*	360.00*	204.00*	262.00*	330.00	371.00*	338.00*	242.00	284.00*	239.00	86.40	186.00
61	92.50*	123.00*	123.00*	123.00*	132.00	131.00	182.00	136.00	113.00	126.00	103.00	114.00
71	135.00	195.00	105.00	182.00	76.20	181.00	145.00	159.00	159.00	149.00	150.00	150.00
81	149.00	177.00	155.00	142.00	110.00	139.00	123.00	181.00	117.00	149.00	75.70*	114.00*
91	177.48	162.71	189.82	123.35	164.36	140.11	153.49	136.84	151.10	149.95	168.67	122.61
101	189.00	174.00	191.00	193.00	186.00	178.00	186.00	22.90	133.00	199.00	174.00	170.00
111	109.00	121.60	140.00	170.00	139.00	103.00	113.00	42.60	133.00	149.00	141.00	212.00
121	151.00	146.00	*	*	175.00	164.00	173.00	198.00	156.00	176.00	137.00	161.00
131	171.90	172.90	143.20	177.30	155.20	185.20	131.00	168.00	128.70	146.40	92.80	133.80
141	119.00	142.00	117.00	213.00	230.00	198.00	184.00	216.00	148.00	111.00	179.00	187.00
151	83.00*	31.03*	54.00*	40.00*	66.00*	89.00*	86.00*	76.00*	97.00	106.00	52.00*	80.00*
171	170.00	193.00	161.00	203.00	115.00	212.00	115.00	150.00	147.00	128.00	99.30	158.00
181	195.00	200.00	60.20	204.00	192.00	198.70	194.20	202.00	178.60	195.00	190.40	169.00
191	149.00	185.00	139.00	162.00	127.00	137.00	124.00	179.00	139.00	131.00	148.00	163.00
201	176.00*	436.00*	615.00*	475.00*	*	*	486.00*	576.00*	200.00*	488.00*	585.00*	689.00*
211	195.00	156.00	112.00	175.50	276.60	276.30	192.00	198.30	184.60	101.10	222.90	240.50
221	166.60	199.10	171.80	186.00	181.70	191.50	176.50	192.90	160.50	189.40	166.00	184.40

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-19. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
 RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	6	7
HIGH YOUNDEN PAIR TRUE VALUE UG/L	186.00	214.00
11	174.00	193.00
21	129.00	125.00
31	*	*
41	*	*
61	126.00*	85.00*
71	116.00	220.00
81	*	*
91	*	*
101	*	*
111	*	*
121	167.00	152.00
131	*	*
141	*	*
151	*	*
171	174.00	196.00
181	*	*
191	159.00	171.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-20.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIFTO
PAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

I N V S: PAGE 274

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60	20.40	23.60
11	24.20	22.50	17.00	17.00	28.00	32.20	19.60	24.20	27.80	21.00	24.90	25.40
21	20.70	22.80	25.50	21.50	13.90	14.80	28.10	32.90	6.60	15.50	16.50	18.30
31	38.70	17.80	23.40	21.90	84.20	29.20	26.80	19.50	22.50	27.30	26.20	32.50
41	20.70	23.80	13.70	13.70	12.40	11.10	25.30	25.30	24.90	32.60	42.50	23.90
61	9.58	13.70	15.50	19.80	18.20	19.20	16.00	15.30	14.00	18.20	12.90	17.50
71	15.90	17.30	11.80	14.60	23.70	18.30	12.00	20.90	17.70	14.80	15.00	17.30
81	7.50	9.30	9.37	9.99	6.36	7.36	7.33	9.96	10.56	18.11	8.90	8.10
91	9.49	13.02	14.10	23.20	15.90	18.50	18.80	14.10	0.00	122.00	9.43	16.40
101	15.20	13.20	16.70	36.00	18.10	24.10	41.70	4.90	32.00	113.00	16.70	20.10
111	19.50	22.90	20.90	22.80	17.20	19.70	17.60	23.40	18.50	21.40	24.10	22.20
121	19.10	20.40	18.70	18.00	16.50	24.10	17.60	23.40	21.30	23.20	17.60	21.80
131	20.40	17.90	20.90	22.80	17.20	19.70	17.60	23.40	21.30	23.20	16.80	12.70
141	18.80	22.10	18.70	18.00	16.50	24.10	17.60	23.40	21.30	23.20	16.80	12.70
151	12.50	5.90	4.00	13.20	8.20	15.00	3.10	11.10	15.60	20.30	15.00	16.30
171	5.81	7.55	14.60	17.90	17.30	21.20	16.70	20.00	18.40	20.80	12.80	19.40
181	16.30	18.60	24.60	27.80	17.90	19.00	19.80	19.90	16.20	17.40	15.40	18.70
191	17.60	19.70	17.30	17.00	9.65	19.20	12.30	11.80	5.70	14.90	15.30	24.80
201	17.60	19.70	73.20	103.00	35.00	30.10	46.00	18.80	46.00	129.00	12.90	15.00
211	25.00	16.30	24.90	27.90	22.00	21.30	46.00	18.80	142.50	146.00	20.00	25.80
221	20.00	22.90	21.70	35.10	22.60	43.10	21.30	19.10	26.20	31.40	19.70	29.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-20. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER		
11	27.00	26.90
21	6.25*	15.30*
31	*	*
41	*	*
61	11.50	23.80
71	17.10	18.80
81	*	*
91	*	*
101	*	*
111	*	*
121	16.20	17.10
131	*	*
141	*	*
151	*	*
171	10.10	17.80
181	*	*
191	42.50	17.40
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-21.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS: FID

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00
11	46.20	61.80			41.50	46.70	61.60	57.70	45.30	43.10	48.40	55.40
21	16.20	50.00	30.60	59.10	16.60	41.90	29.10	63.60	29.20	26.10	23.50	43.70
31	34.00	55.90	46.00	52.70	34.20	45.60	19.60	61.20	19.50	48.90	29.40	62.00
41	45.90	59.60	55.40	62.30	44.50	192.00	119.00	72.70	123.00	75.90	52.00	63.00
61	36.00	44.50			29.20	39.10	56.10	45.30	34.00	37.90	27.90	42.00
71	31.40	49.40	75.20	131.00	41.40	52.50	24.50	44.40	43.50	43.10	35.20	42.70
81	33.70	39.60	34.80	40.60	46.90	35.30	39.40	45.70	32.70	36.30	36.30	33.30
91	25.43	46.98	36.42	76.98	55.43	86.93	51.12	89.36	35.43	76.12	63.49	95.11
101	37.10	50.80	36.20	48.30	32.80	36.20	48.30	34.00	80.10	88.70	38.80	46.50
111	48.40	55.70	60.80	70.70	33.80	53.90	77.60	210.00	108.00	66.10	165.00	31.20
121	39.40	47.60			38.10	53.10	44.10	54.40	43.30	51.70	46.80	43.10
131	45.20	48.60	47.60	62.10	44.60	53.60	36.50	44.10	35.90	46.00	22.00	34.80
141	47.50	54.50	43.70	50.40	46.30	70.70	44.40	60.40	36.60	46.70	43.00	47.80
151	27.00	40.00	25.03	33.00	31.00	1.00	59.00	69.00	27.00	277.00	16.00	22.00
171	38.80	47.30	38.40	47.10	36.70	59.00	35.00	45.10	33.70	47.00	41.90	48.00
181	38.60	55.70	54.60	85.20	41.40	59.20	43.30	89.20	39.00	49.20	38.70	56.30
191	37.60	50.20	33.60	41.60	33.30	47.40	28.20	46.20	46.60	40.30	40.70	51.20
201	42.00	147.00	243.03	236.00	101.00		106.00	87.00	77.00	110.00	140.00	125.00
211	53.50	53.50	26.50	77.90	56.50	87.50	51.50	71.30	156.50	164.20	33.30	50.00
221	54.00	57.10	70.70	71.70	68.70	60.20	65.10	55.90	62.70	65.60	52.90	61.40

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-21. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
 RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
	50.20	59.00
LABORATORY NUMBER		
11	50.20	86.80
21	37.60*	45.70*
31	*	*
41	*	*
61	53.90	78.00
71	39.70	53.90
81	*	*
91	*	*
101	*	*
111	*	*
121	42.50	54.40
131	*	*
141	*	*
151	*	*
171	26.70	44.20
181	*	*
191	33.50	49.60
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-22.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 278

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIFID

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00	200.00	236.00
11	184.00	214.00	*	193.00	192.00	192.00	245.00	222.00	230.00	239.00	201.00	242.00
21	161.00	206.00	150.00	121.00	131.00	131.00	148.00	234.00	215.00	123.00	130.00	149.00
31	203.00	218.00	164.00	201.00	185.00	185.00	206.00	208.00	165.00	217.00	143.00	214.00
41	190.00	247.00	223.00	272.00	463.00	517.00	205.00	256.00	243.00	269.00	195.00	275.00
61	102.00	145.00	*	152.00	139.00	139.00	233.00	176.00	143.00	159.00	146.00	150.00
71	122.00	179.00	110.00	207.00	171.00	169.00	120.00	125.00	141.00	136.00	165.00	144.00
81	130.00	162.00	115.00	121.00	133.00	129.00	129.00	160.00	124.00	135.00	105.00	123.00
91	160.13	168.25	150.43	135.95	192.41	135.83	131.38	159.83	162.19	133.32	170.01	109.99
101	136.00	177.00	186.00	187.00	177.00	181.00	177.00	13.10	162.00	229.00	168.00	174.00
111	194.00	208.00	299.00	228.00	194.00	223.00	212.00	28.30	244.00	202.00	194.00	379.00
121	166.00	159.00	*	194.00	178.00	178.00	193.00	217.00	179.00	190.00	146.00	203.00
131	176.40	186.60	163.00	229.70	161.20	196.90	147.70	181.00	158.40	201.90	107.00	177.70
141	190.00	228.00	199.00	210.00	234.00	232.00	192.00	235.00	166.00	121.00	203.00	223.00
151	89.00	36.00	64.00	70.00	72.00	95.00	120.00	115.00	97.00	119.00	70.00	101.00
171	180.00	202.00	166.00	217.00	122.00	214.00	132.00	173.00	158.00	148.00	127.00	202.00
181	160.00	216.00	59.20	259.00	180.00	218.00	229.30	223.00	173.00	192.60	191.10	185.50
191	163.00	212.00	142.00	184.00	137.00	156.00	136.00	200.00	172.00	171.00	150.00	188.00
201	189.00	442.00	677.00	580.00	*	570.00	570.00	551.00	87.00	475.00	548.00	684.00
211	188.40	162.50	135.40	215.50	283.00	264.00	192.50	196.80	312.50	301.10	192.90	250.00
221	200.60	243.23	209.40	238.20	220.20	271.40	211.30	246.30	204.40	244.60	207.90	236.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-22. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-1) ENV PHENOLISFID

PAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	4	6
LABORATORY NUMBER	200.00	236.00
11	193.00	192.00
21	158.00*	136.00*
31	*	*
41	*	*
61	235.00	162.00
71	107.00	201.00
81	*	*
91	*	*
101	*	*
111	*	*
121	181.00	168.00
131	*	*
141	*	*
151	*	*
171	177.00	203.00
181	*	*
191	179.00	198.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-23.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISFID

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG DATA TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20
11	14.70	9.48	*	*	15.30	11.40	54.70	54.00	12.10	11.20	9.19	9.70
21	22.00	22.00	20.90	19.50	18.10	15.90	92.00	77.00	29.50	32.90*	12.00	27.40
31	15.30	12.50	14.80	16.60	26.00	24.90	0.00*	0.00*	16.60	16.60	16.20	12.90
41	17.10	11.90	14.00	12.10	86.90*	15.90*	18.80	94.36	31.30*	29.70*	17.20	0.99
61	47.00*	23.40	*	*	437.00*	317.00*	49.60	0.00*	33.10*	72.70*	92.30*	260.00*
71	20.70	20.40	33.80*	20.10	21.60	10.90	11.70	110.00	12.70	13.90	13.50	27.20
81	4.24*	6.73	15.60	14.70	29.20	14.10	5.45	0.00*	33.90	16.10	3.98	7.71
91	15.64	23.14	15.44	20.43	11.22	28.12	15.10	15.59	15.93	19.99	9.43	34.41
101	12.60	11.80	5.77*	8.73*	3.14*	6.73*	136.00	91.00	0.00*	0.00*	11.00	10.10
111	20.60	18.90	13.70	15.70	18.80	15.70	53.10	21.40	21.50	12.90	18.40	16.50
121	16.70	14.60	*	*	19.30	*	*	18.60	29.80	21.00	17.20	19.10
131	19.90	12.60	21.10	18.00	17.20	16.90	0.00*	0.00*	20.80	13.70	8.00	13.60
141	15.50	14.90	16.50	11.90	20.20	16.90	93.00	0.00*	13.40	14.00	18.30	17.10
151	19.00	0.00*	5.40	0.00*	3.40*	0.00*	0.00*	0.00*	70.00*	0.00*	0.00*	0.00*
171	0.00*	0.00*	14.90	15.00	16.70	16.10	28.00	0.00*	18.00	16.80	15.80	17.10
181	16.10	6.10	14.90	8.30	12.30	15.90	20.60	*	15.20	14.50	44.90*	70.60*
191	14.90	13.80	7.81	3.01	6.09	13.70	*	15.80	19.70	19.00	10.30	7.50
201	*	*	*	*	*	*	*	*	297.00*	173.00*	*	*
211	17.20	16.80	13.40	6.30	9.30	7.10	3.80	12.70	21.00	23.10	4.10*	7.20*
221	17.40	17.70	20.10	24.70	18.60	25.50	32.30	29.70	28.40	22.00	22.10	34.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - MON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-23. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

PAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER	
	1	2
LABORATORY NUMBER	17.80	16.20
11	17.50*	16.50
21	12.50 *	12.50 *
31		
41		
61	42.70*	30.80*
71	12.10	13.70 *
81		
91		
101		
111		
121	31.10*	24.00 *
131		
141		
151		
171	2.98*	4.22*
181		
191	11.60 *	10.30 *
201		
211		
221		

* = REJECTED

WATER LEGEND

7 - TAP WATER - OC

TABLE A-24.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAJ DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YUJUDEN PAIR TRUE VALUF UG/L	WATER 1			WATER 2			WATER 3			WATER 4			WATER 5			WATER 6		
	3	5	5	3	5	5	3	5	5	3	5	5	3	5	5	3	5	5
LABORATORY NUMBER																		
11	135.00	121.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
21	124.00	130.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
31	26.40	111.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
41	1.01	111.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
51	135.00	123.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
61	87.10	144.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
71	130.00	135.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
81	30.10	98.10	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
91	105.64	50.95	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
101	94.20	141.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
111	131.00	119.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
121	104.00	106.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
131	151.50	121.80	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
141	62.20	108.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
151	116.00	123.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
161	69.70	83.40	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
171	95.30	109.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
181	115.00	119.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
191	131.00	293.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
201	109.20	83.50	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
211	135.00	98.00	135.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00	121.00	135.00
221																		

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-24. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YUDEM PAIR TRUE VALUE UG/L	WATER	
	3	5
LABORATORY NUMBER		
11	135.00	121.00
21	155.00	100.00
31	113.00	97.50
41	*	*
61	120.00*	525.00*
71	84.80	102.00
81	*	*
91	*	*
101	*	*
111	*	*
121	155.00	115.00
131	*	*
141	*	*
151	*	*
171	57.10*	42.30*
181	*	*
191	78.90	94.50
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-25.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSDIFIED

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00
11	225.00	188.00	182.00	171.00	142.00	142.00	358.00	129.00	154.00	166.00	252.00	222.00
21	176.00	167.00	134.00	151.00	122.00	122.00	114.00	102.00	171.00	165.00	124.00	128.00
31	242.00	197.00	198.00	207.00	169.00	169.00	236.00	176.00	172.00	174.00	177.00	214.00
41	216.00	227.00	226.00	207.00	385.00*	503.00*	204.00	188.00	263.00*	384.00*	210.00	245.00
61	171.00	159.00	171.00	181.00	802.00*	741.00*	170.00	107.00	623.00*	547.00*	597.00*	698.00*
71	179.00	177.00	25.70	47.90	95.20	170.00	205.00	273.00	154.00	108.00	171.00	89.10
81	180.00	187.00	185.00	195.00	118.00	205.00	312.54	115.43	140.00	145.00	118.00	122.00
91	344.88*	73.02	296.31	1.31	296.37	177.63	392.00	0.00*	292.02	99.64	301.82	89.19
101	201.00	154.00	116.00*	63.70*	34.20*	39.98*	259.00	36.30	108.00	106.00	88.40	58.90
111	134.00	182.00	242.00	198.00	225.00	190.00	259.00	173.00	218.00	145.00	211.00	189.00
121	186.00	161.00	213.50	200.60	182.50	182.50	261.80	295.30	265.00	212.00	187.00	111.00
131	231.70	192.30	207.00	267.00	252.00	193.00	164.00	65.00	195.00	101.00	227.00	177.00
141	211.00	194.00	110.00	84.00*	63.00*	129.00	123.00	130.00	100.00	70.00	71.00	267.00
151	202.00	119.00	207.00	133.00	146.00	129.00	221.00	173.40	130.00	130.00	182.00	200.00
171	184.00	195.00	209.00	137.00	162.00	226.70	129.00	361.00	179.00	143.30	242.10	157.70
181	180.00	180.00	63.83	190.00	159.00	129.00	354.00	86.00	179.00	132.00	190.00	166.00
191	210.00	207.00	145.00	137.00	153.00	153.00	129.00	361.00	145.00	311.00	445.00*	366.00
201	214.00*	339.00*	567.00*	442.00*	442.00*	442.00*	10.50	0.00*	195.60	110.90	133.20*	73.00*
211	207.80	103.20	139.00	94.30	141.60	101.90	232.50	216.10	221.90	177.90	141.30	173.60
221	206.90	172.70	218.30	175.60	242.70	183.50	232.50	216.10	221.90	177.90	141.30	173.60

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-25. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV #HENDLS#FID

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER	226.00	202.00
11	255.00	190.00
21	193.00	196.00
31	*	*
41	*	*
61	315.00*	208.00*
71	100.00	166.00
81	*	*
91	*	*
101	*	*
111	*	*
121	201.00	161.00
131	*	*
141	*	*
151	*	*
171	158.00*	142.00*
181	*	*
191	176.00	149.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-26.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIFID

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
11	23.20	22.00	25.00	25.00	26.70	26.70	24.10	27.70	44.00	35.20	37.40	34.50
21	19.90	24.90	16.30	14.20*	8.14*	20.30	20.30	22.60	9.62*	19.30*	17.90	20.10
31	22.70	24.10	29.40	25.60	23.10	27.30	23.60	21.20	25.50	31.20	32.90	35.70
41	23.00	30.60	26.60	23.70	24.70	24.20	22.50*	37.20*	26.20*	33.70*	32.00*	29.30*
61	11.80	28.70	16.90	16.90	16.90	16.90	24.20	21.50	20.40	26.70	11.60	17.90
71	18.60	19.40	18.00	19.30	19.20	23.40	14.20	19.40	21.00	16.30	18.40	19.60
81	7.30	11.40	15.20	14.70	16.90	23.60	12.30	18.40	27.40	20.80	9.57*	5.73*
91	4.41	5.75	3.82*	6.36*	3.11*	37.33	1.36*	15.73*	6.01	5.88	5.43	15.33
101	19.00	14.50	23.20	26.70	21.50	24.20	21.50	18.70	0.00*	0.00*	24.00	25.80
111	25.50	28.50	20.50	29.90	22.80	30.60	25.90*	26.60*	23.00	32.60	26.70	27.10
121	25.40	27.90	23.40	26.50	22.80	32.90	1.10	21.00	23.40	24.20	20.30	27.10
131	27.10	25.40	23.30	23.30	30.40	30.40	1.40	30.10	26.40	28.40	17.40	17.20
141	23.30	30.00	11.50*	10.40*	35.40	26.20	25.90	25.90	20.00	28.60	23.50	25.00
151	17.70*	8.80*	15.90	15.90	11.20*	11.20*	2.10*	8.00*	2.10	13.30	29.50	14.90
171	15.90	19.10	17.10	21.70	26.70	26.70	22.20	28.30	24.10	26.60	16.20	22.70
181	18.80	21.70	21.20	22.70	19.00	22.30	26.40	18.90	16.10	21.60	16.80	23.80
191	22.50	27.50	21.20	23.00	22.80	22.80	18.60	21.20	27.00	43.80	17.10	21.60
201	55.30*	73.20*	24.00*	24.00*	24.00*	24.00*	15.10	27.50	75.00*	86.00*	22.50	31.60
211	25.60	20.50	15.00*	11.10*	25.50	26.50	15.10	27.50	21.50	26.50	22.50	31.60
221	25.30	29.30	27.20	27.00	19.40	25.20	28.90	26.80	27.40	29.20	26.00	30.60

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NOM DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-26. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER	
	1	2
	25.00	30.00
LABORATORY NUMBER		
11	25.30	32.70
21	6.80	17.20
31	*	*
41	*	*
61	12.40	30.50
71	16.70	19.40
81	*	*
91	*	*
101	*	*
111	*	*
121	19.20	21.80
131	*	*
141	*	*
151	*	*
171	13.60	24.70
181	*	*
191	20.80	21.80
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-27.

I M V S: PAGE 376

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISFIO

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOU DEN PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	96.70	128.00	52.00	121.00	108.00	116.00	130.00	121.00	106.30	126.00	119.00	128.00
21	26.30	113.00	11.40	22.70	11.40	22.70	32.10	90.60	73.40	76.50	52.10	108.00
31	88.70	128.00	104.00	135.00	66.70	121.00	26.70	152.00	35.50	126.00	44.30	138.00
41	104.00	147.00	134.00	117.00	119.00	160.00	103.00	164.00	134.00	163.00	136.00	174.00
61	67.50	81.23	67.50	81.23	76.40	130.00	137.00	104.00	92.70	122.00	84.30	128.00
71	79.00	146.00	90.20	144.00	109.00	130.00	172.50	139.00	115.00	102.00	97.90	125.00
81	91.00	112.00	85.30	116.00	116.00	116.00	107.00	101.00	86.20	112.00	78.40	83.30
91	53.04	155.16	23.22	143.10	41.54	131.11	42.86	113.04	46.81	129.93	28.45	166.10
101	98.10	125.00	130.00	131.00	96.00	104.00	120.00	0.00	117.00	149.00	109.00	123.00
111	125.00	143.00	122.00	147.00	141.00	139.00	142.00	201.00	129.00	177.00	191.00	132.00
121	104.00	132.00	107.00	151.00	107.00	151.00	92.70	129.00	101.00	115.00	126.00	122.00
131	124.00	126.40	104.90	121.70	111.90	139.10	102.40	112.60	84.50	97.40	63.80	112.00
141	51.00	149.00	110.00	131.00	140.00	166.00	87.20	155.00	88.50	125.00	110.00	121.00
151	79.00	109.00	45.00	77.00	101.00	69.00	77.00	96.00	93.00	428.00	48.00	59.00
161	101.00	128.00	84.75	122.00	92.70	140.00	76.20	132.00	93.70	61.90	89.30	96.40
171	101.00	134.00	104.70	122.90	105.00	123.00	116.00	141.00	107.10	140.10	109.00	147.00
181	90.50	121.00	80.40	116.00	73.30	89.20	83.60	92.20	143.00	99.50	93.10	132.00
191	144.00	407.00	345.00	333.00	520.00	520.00	345.00	241.00	246.00	368.00	340.00	420.00
201	128.50	130.00	22.50	33.20	134.50	206.00	89.50	137.50	24.50	160.50	80.00	118.40
211	109.90	115.60	111.70	127.10	119.70	113.20	99.20	96.00	111.30	125.00	105.60	121.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-27. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER		
11	119.00	106.00
21	89.10	102.00
31	*	*
41	*	*
61	66.80	90.80
71	100.00	147.00
81	*	*
91	*	*
101	*	*
111	*	*
121	110.00	149.00
131	*	*
141	*	*
151	*	*
171	64.80	115.00
181	*	*
191	85.20	115.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-28.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SIFID
RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
		4	6	4	6	4	6	4	6	4	6	4	6
312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00
240.00	273.00	190.00	134.00	282.00	282.00	311.00	326.00	326.00	443.00	304.00	375.00	304.00	375.00
231.00	303.00	240.00	319.00	129.00	105.00	185.00	324.00	324.00	207.00	226.00	239.00	226.00	239.00
268.00	330.00	240.00	319.00	264.00	240.00	295.00	315.00	315.00	349.00	214.00	359.00	214.00	359.00
249.00	300.00	287.00	381.00	372.00	425.00	340.00	375.00	375.00	442.00	305.00	478.00	305.00	478.00
180.00	223.00	114.00	123.00	245.00	262.00	384.00	270.00	270.00	268.00	257.00	268.00	257.00	268.00
213.00	323.00	114.00	123.00	125.00	307.00	231.00	270.00	270.00	250.00	267.00	273.00	273.00	273.00
240.00	306.00	262.00	240.00	190.00	259.00	223.00	312.00	312.00	226.00	275.00	130.00	130.00	217.00
231.17	256.00	186.41	182.71	183.46	220.94	158.38	208.94	208.94	199.96	196.43	173.71	173.71	220.39
299.00	277.00	292.00	282.00	284.00	301.00	284.00	284.00	284.00	327.00	261.00	270.00	261.00	270.00
314.00	348.00	114.00	392.00	310.00	179.00	321.00	374.00	374.00	305.00	319.00	365.00	319.00	365.00
271.00	285.00	258.10	317.50	295.00	315.00	307.00	362.00	362.00	302.00	302.00	330.00	302.00	330.00
276.70	289.50	271.00	342.00	294.30	317.90	238.40	295.20	295.20	229.90	288.30	302.70	288.30	302.70
266.00	291.00	271.00	342.00	376.00	283.00	279.00	298.00	298.00	258.00	208.00	290.00	208.00	290.00
163.00	58.00	116.00	103.00	133.00	149.00	166.00	130.00	130.00	192.00	176.00	117.00	117.00	160.00
254.00	302.00	242.00	363.00	183.00	349.00	209.00	260.00	260.00	243.00	218.00	136.00	136.00	281.00
229.00	360.00	85.10	395.90	253.00	342.00	250.00	352.00	352.00	274.10	340.90	272.00	272.00	285.00
229.00	287.00	224.00	241.00	201.00	212.00	168.00	287.00	287.00	235.00	246.00	253.00	253.00	248.00
340.00	832.00	167.79	181.50	407.20	393.50	188.00	110.00	110.00	241.00	259.00	826.00	826.00	290.00
273.70	232.57	254.10	329.70	291.60	343.40	305.00	315.00	315.00	267.50	311.10	241.90	241.90	367.50
251.20	301.13								262.80	324.20	265.70	265.70	296.40

* = REJECTED

WATER LEGEND
1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-28. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG SAIR TRUE VALUE UG/L	WATER 4	7
LABORATORY NUMBER		
11	312.00	374.00
21	296.00	288.00
31	185.00	186.00
41	*	*
61	150.00	184.00
71	182.00	335.00
81	*	*
91	*	*
101	*	*
111	*	*
121	302.00	272.00
131	*	*
141	*	*
151	*	*
171	261.00	309.00
181	*	*
191	316.00	360.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-29.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISFID

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
28.20	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00
11	20.90	10.00	*	*	20.00	21.20	21.90	21.10	15.40	17.30	20.00	25.00
21	17.10	17.10	13.50	13.50	20.30	14.20	19.00	19.00	16.70	17.80	15.30	15.40
31	7.68	6.93	12.50	16.50	12.60	18.20	15.90	11.30	9.70	11.20	14.60	12.80
41	18.60	16.60	12.20	12.00	30.00	12.40	27.80	38.30	12.50*	24.80*	9.36	13.70
61	6.27*	1.80*	*	*	3.25*	0.00*	5.72	8.01	6.23	7.84	5.21	1.61
71	13.70	22.60	20.20	12.30	40.20	20.70	15.90	9.90	14.00	10.00	26.40	52.40*
81	1.93	2.49	11.80	7.30	37.00	2.62	0.00*	32.20	0.00*	13.30	31.50	0.00*
91	18.14	25.64	16.94	20.84	16.01	30.50	11.97	18.84	16.81	21.84	13.83	20.68
101	7.78	10.00	15.00	16.70	7.78	13.30	7.78	20.00	0.00*	0.00*	23.30	15.00
111	29.70	13.50	23.70	21.90	13.90	22.40	20.60	21.00	13.30	15.40	29.00	23.70
121	9.92	11.15	*	*	10.20	14.90	10.50	13.00	20.70	23.80	15.00	14.70
131	23.10	16.40	18.90	16.60	11.90	16.50	17.30	10.60	0.00*	0.00*	5.60	19.00
141	2.84	3.36	24.90	2.94	12.30	15.00	2.04	3.10	2.32	7.30	3.36	4.92
151	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	9.00*	56.00*	0.00*	0.00*	0.00*
171	0.00*	8.60	11.50	13.13	10.70	13.50	16.90	17.10	13.80	13.20	11.30	14.90
181	9.60	13.30	14.10	11.60	5.80	25.00	*	*	2.40	15.40	*	*
191	25.50*	30.10*	11.60	9.81	7.72	12.10	10.70	11.40	15.00	17.70	9.08	9.89
201	*	*	*	*	*	*	*	*	203.00*	156.00*	*	*
211	5.00*	4.00*	1.00*	1.10*	5.00	4.00	5.10	2.00	3.50	14.00	4.50	5.40
221	19.00	20.10	17.60	20.70	19.20	19.60	23.70	21.80	18.60	19.10	16.10	23.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-29. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG AIR TRUE VALUE UG/L	WATER TYPE	
	1	2
LABORATORY NUMBER	28.20	32.00
11	32.30	23.80
21	7.63	10.50
31	*	*
41	*	*
61	6.94	32.32
71	9.57	17.50
81	*	*
91	*	*
101	*	*
111	*	*
121	15.80	12.10
131	*	*
141	*	*
151	*	*
171	6.44	10.00
181	*	*
191	24.90	24.40
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-30.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 426

EPA METHOD VALIDATION STUDY--IT ENV PHENOLISFID

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
MEDIUM YOUNG PAIR TRUE VALUE UG/L	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00
11	93.80	116.00	*	*	92.20	107.60	103.60	100.00	126.00	92.70	118.60	142.00
21	34.50	137.00	72.80	134.00	44.80	108.00	40.60	117.00	41.20	50.10	40.20	82.00
31	73.20	106.00	94.80	119.00	61.10	103.00	26.50	146.00	30.40	99.20	29.60	104.00
41	92.60	110.00	119.00	98.00	141.00	193.00	83.60	149.00	328.00*	204.00*	141.00	181.00
61	32.40*	73.70*	*	*	40.40*	51.30*	50.60	86.00	62.00	102.00	36.60	191.00
71	67.90	109.00	67.60	107.00	70.20	174.00	48.60	70.30	140.00	117.00	95.00	78.00
81	0.60*	145.00	96.10	112.00	34.80	4.30	97.40	86.00	61.00	23.80	0.00*	0.00*
91	168.90	139.99	136.85	123.81	122.99	125.04	137.72	155.12	112.82	128.63	152.62	146.74
101	70.10	130.00	70.10	130.00	70.10	85.10	100.00	11.60	100.00	130.00	85.10	130.00
111	90.40	104.00	94.40	85.00	101.00	91.30	118.10	67.10	105.00	294.00*	48.00	139.00
121	78.00	115.00	*	*	87.50	128.00	94.80	92.20	99.20	124.00	93.10	93.80
131	142.70	96.30	93.00	88.30	84.90	85.40	98.20	80.40	0.00*	62.40*	53.60	78.60
141	78.60	102.00	88.60	99.90	116.00	117.00	90.70	112.00	50.20	62.70	79.50	83.00
151	71.00*	0.00*	111.00	49.00	98.00	27.00	107.60	36.00	71.00	36.00	45.00*	54.00*
161	95.00	95.00	83.70	100.00	76.40	115.00	83.40	112.00	87.80	57.10	72.80	74.10
171	65.30	104.00	88.50	77.40	86.80	81.40	85.10	145.00	72.90	49.30	73.90	52.20
181	194.00*	236.00*	61.50	75.80	84.90	100.00	89.90	82.20	108.00	96.60	100.00	91.40
201	146.00	137.00	306.00*	272.00*	214.00*	*	214.00*	214.00	168.00*	214.00*	*	201.00*
211	99.60*	47.50*	5.00*	34.40*	51.70	81.60	49.50	71.90	17.50	84.50	44.60	57.30
221	96.70	98.60	100.60	102.10	99.70	102.10	103.80	96.20	109.90	131.00	88.70	106.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-30. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER TYPE	
	3	5
11	210.00	240.00
21	119.00	100.00
31	78.60	90.10
41	*	*
61	46.70	330.00*
71	64.20	96.20
81	*	*
91	*	*
101	*	*
111	*	*
121	107.00	111.00
131	*	*
141	*	*
151	*	*
171	56.20	72.20
181	*	*
191	67.30	168.00*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-31.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH TOUNEN PAIP TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00	280.00	320.00
11	139.00	144.00	*	158.00	165.00	191.00	167.00	132.00	169.00	157.00	172.00	
21	178.00	211.00*	138.00	116.00	119.00	141.00	166.00	62.30	85.40	120.00	120.00	
31	142.00	158.00	121.00	133.00	134.00	178.00	187.00	122.00	159.00	105.00	151.00	
41	121.00	171.00	137.00	211.00	337.00*	176.00	180.00	224.00*	204.00*	174.00	277.00*	
61	64.20*	82.00*	66.00*	96.00*	69.30*	112.00	124.00	98.30	138.00	82.90	135.00	
71	84.00	117.00	46.80	38.80	128.00	79.30	124.00	134.00	125.00	103.00	96.50	
81	146.00	10.00*	112.00	24.40	0.00*	41.30	64.80	10.30	69.00	0.00*	0.00*	
91	367.24*	117.44	298.04*	135.74	179.41	242.82	100.83	301.05*	106.97	312.01*	96.79	
101	130.00	130.00	145.00	130.00	130.00	130.00	0.00*	64.40	130.00	130.00	130.00	
111	242.00*	107.00	143.00	128.00	125.00	153.00	61.50	183.00	143.00	415.00*	152.00	
121	109.00	124.00	*	127.00	139.00	136.00	149.00	160.00	168.00	101.00	128.00	
131	173.50	147.00	125.00	122.40	107.80	121.00	132.20	0.00*	0.00*	75.10	117.90	
141	127.00	154.00	126.00	163.00	234.00*	124.00	183.00	92.00	91.90	159.00	146.00	
151	21.00*	0.07*	0.00*	170.00	69.00	89.00	0.00*	35.00	71.00	80.00*	0.00*	
171	148.00	159.00	146.00	175.00	69.50	109.00	123.00	107.00	95.40	57.90	125.00	
181	78.00	128.00	49.70	82.10	150.00	98.10	87.30	84.90	83.90	100.90	64.90	
191	261.00*	337.00*	98.10	169.00	113.00	109.00	151.00	108.00	133.00	107.00	136.00	
201	134.00	306.00*	485.00*	707.00*	*	498.00*	432.00*	191.00*	237.00*	306.00*	260.00*	
211	63.30*	57.50*	33.40*	56.80*	86.10	90.30	86.20	63.00	87.80	67.50	98.00	
221	144.90	140.40	122.10	145.30	135.30	146.50	158.70	153.70	167.70	121.10	125.50	

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-31. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FTD

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	7	6
11	280.00	320.00
21	150.00	152.00
31	142.00	111.00
41	•	•
61	194.00	71.93
71	60.00	133.00
81	•	•
91	•	•
101	•	•
111	•	•
121	111.00	114.00
131	•	•
141	•	•
151	•	•
171	121.00	131.00
181	•	•
191	241.00	465.00
201	•	•
211	•	•
221	•	•

• = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-32.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

I M V S: PAGE 474

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LOW YOUNG PAIR TRUE VALUE UG/L	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60	29.80	33.60
11	19.40	23.40	22.30	23.70	27.90	24.60	31.50	41.00	36.10	34.40	26.50	29.90
21	22.40	22.40	26.80	31.90	33.40	30.90	76.80*	70.60	0.70*	21.10	0.00*	14.60
31	28.30	25.90	30.09	28.30	24.60	27.80	31.10	26.50	24.70	28.30	30.90	30.90
41	133.00*	42.64	30.09	28.30	32.30	33.80	35.80	28.80	44.50	38.50	36.70	32.20
61	16.70	22.90	29.70	29.10	36.00	36.00	16.10	24.60	17.60*	16.60*	19.60	23.40
71	7.54*	10.70*	25.30	21.90	18.80	24.90	17.50	19.90	22.30	17.80	10.90*	5.15*
81	19.04	20.48	15.37	15.22	15.74	33.43	18.02	22.09	21.02	31.08	13.11	26.39
101	6.30	4.00	22.90	30.00	16.10	18.10	12.00*	0.00*	0.00*	0.00*	22.70	25.70
111	40.90	25.70	22.20	26.50	33.50	26.00	9.60	11.60	28.60	30.70	32.70	17.40
121	28.50	34.50	35.80	37.40	37.40	37.40	28.30	24.30	25.70	22.80	38.00	40.90
131	51.00	45.30	37.70	37.10	42.20	50.20*	36.80	50.10	40.40	37.20	30.10	29.90
141	28.70	30.30	29.90	24.30	23.80	65.60*	5.70	0.00*	29.70	37.20	30.10	42.10
151	36.00	20.00	14.00	0.00*	21.00	0.00*	18.60	17.00	28.00	39.00	23.00	51.00
171	0.00*	0.00*	22.60	27.20	25.30	28.30	21.50	23.00	32.80	34.90	18.70	20.20
181	22.40	21.30	23.20	20.30	23.60	27.60	26.50	19.00	19.00	27.30	19.70	27.80
191	22.40	25.90	22.90	20.90	13.60	23.60	24.00	21.80	28.40	37.40	21.00	23.30
201	136.00*	136.00*	115.00*	115.00*	28.90	27.20	56.20	56.80	165.00*	165.00*	37.60*	46.00*
211	18.60	12.90	36.70	30.00	28.90	30.10	24.50	20.40	38.50	49.00	34.00	54.10
221	23.10	23.70	32.50	32.30	28.20	30.10	24.50	20.40	33.70	31.60	34.00	54.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-32. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER TYPE	
	1	2
11	27.90	35.90
21	19.30	23.50
31	*	*
41	*	*
61	*	*
71	13.30	18.50
81	*	*
91	*	*
101	*	*
111	*	*
121	34.60	32.20
131	*	*
141	*	*
151	*	*
171	8.62	14.40
181	*	*
191	22.60	21.90
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - YAP WATER - DC

TABLE A-33.

I N V S: PAGE 476

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FIO

RAW DATA FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOU DEN PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	219.00	267.00*			155.00	158.00	184.00	193.00	199.00	169.00	210.00	216.00
21	28.70	112.00	73.80	155.00	59.50	127.00	85.40	123.00	105.00	108.00	75.00	138.00
31	110.00	143.00	125.00	154.00	80.90	137.00	38.40	163.00	36.90	129.00	49.00	164.00
41	155.00	165.00	172.00	161.00	155.00	191.00	99.60	190.00	126.00	308.00	170.00	217.00
61	240.00*	270.00*			69.80		286.00*	363.00*	116.00	238.00	190.00	188.00
71	91.50	138.00	94.00	2.76*	105.00	157.00	75.10	122.00	100.00*	95.60*	110.00	107.00
81	84.10*	127.00*	107.00	125.00	133.00	125.00	119.00	115.00	93.60	126.00	114.00*	98.90*
91	90.44	163.92	101.34	112.93	105.11	169.14	91.82	184.03	93.43	142.42	69.44	156.70
101	92.70	140.00	111.00	145.00	120.00	100.00	97.00*	0.00*	128.30	156.00	121.00	150.00
111	114.00	120.00	112.00	131.00	126.00	119.00	139.00	0.00*	115.00	147.00	0.00*	94.60
121	121.00	127.00			125.00	166.00	195.00	152.00	118.00	135.00	143.00	136.00
131	155.50	158.00	133.60	147.30	149.30	170.40	124.80	137.00	126.60	135.10	77.80	126.20
141	64.50	170.00	139.00	162.00	153.00	150.00	153.00	214.00	132.00	163.00	134.00	159.00
151	122.00	163.00	217.00	97.00	165.00	66.00	215.00	90.00	189.00	93.00	93.00	94.00
161	97.00	119.00	128.00	128.00	114.00	162.00	104.00	146.00	134.00	81.40	124.00	129.00
171	106.50	161.00	98.10	153.00	108.00	133.00	174.00	348.00*	120.20	125.80	139.50	191.50
181	110.00	140.00	97.20	110.00	93.60	120.00	110.00	133.00	149.00	122.00	125.00	144.00
191	226.00*	443.00*	341.00*	425.00*	307.00*				276.00*	437.00*	302.00*	302.00*
201	197.50	268.23	24.00	193.30	290.00*	385.90*	183.40	249.30	50.00	318.70	152.50*	288.20*
211	144.10	131.30	159.20	150.40	168.00	140.10	142.30	141.80	160.80	161.90	158.20	163.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-33. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 7	
	3	5
MEAN TRUE VALUE UG/L	149.00	169.00
LABORATORY NUMBER		
11	178.00	157.00
21	130.00	100.44
31	*	*
41	*	*
61	609.00*	644.00*
71	89.30	125.00
81	*	*
91	*	*
101	*	*
111	*	*
121	193.00	165.00
131	*	*
141	*	*
151	*	*
171	72.40*	95.10*
181	*	*
191	94.70	128.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-34.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S PAGE 478

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS: FID

RAW DATA FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00	298.00	338.00
11	500.00*	506.00*			350.00	355.00	439.00	363.00	342.00	532.00	410.00	475.00
21	244.00	271.00	225.00	325.00	201.00	189.00	185.00	284.00	223.00	263.00	237.00	346.00
31	281.00	289.00	251.00	278.00	250.00	257.00	279.00	318.00	228.00	297.00	222.00	312.00
41	303.00	383.00	350.00	374.00	354.00	379.00	316.00	369.00	420.00	497.00	320.00	447.00
61	309.00*	411.00*			310.00	315.00	583.00*		511.00*	596.00	434.00	464.00
71	188.00	221.00	2.17*	1.24*	90.60	205.00	174.00	188.00	218.00*	198.00*	220.00	178.00
81	221.00*	251.00*	242.00	196.00	166.00	224.00	225.00	296.00	205.00	255.00	96.70*	197.00*
91	281.40	183.43	247.63	167.63	205.41	205.65	190.96	153.11	215.13	162.09	253.50	95.43
101	250.00	233.00	240.00	265.00	261.00	271.00	229.00*	0.00*	187.00	284.00	246.00	267.00
111	234.00	134.00	246.00	253.00	231.00	259.00	243.00	91.30	227.00	201.00	248.00	255.00
121	266.00	278.00			304.00	293.00	294.00	360.00	261.00	279.00	256.00	300.00
131	295.90	300.50	267.40	319.10	267.50	309.00	236.30	279.30	271.10	244.40	187.10	274.50
141	304.00	334.00	299.00	385.00	381.00	469.00	290.00	429.00	307.00	193.00	318.00	315.00
151	244.00	185.00	145.00	382.00	262.00	299.00	242.00	104.00	226.00	183.00	260.00	128.00
171	232.00	278.00	295.00	319.00	165.00	307.00	190.00	230.00	234.00	211.00	213.00	290.00
181	258.00	291.00	94.40	287.00	255.00	292.00	395.00	380.00	210.80	237.80	334.90	303.20
191	232.00	292.00	213.00	248.00	187.00	226.00	210.00	261.00	250.00	244.00	234.00	262.00
201	288.00*	592.00*	404.00*	685.00*			450.00*	422.00*	264.00*	437.00*	623.00*	775.00*
211	375.00*	335.80	278.20	432.50	536.00*	491.90	421.10	413.00	395.00	457.80	393.00*	485.40*
221	251.30	271.80	277.50	284.40	302.50	290.20	324.90	312.30	314.40	328.30	312.60	303.80

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-34. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSLFID

RAW DATA FOR 4,6-DINITRO-2-METHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
	298.00	336.00
LABORATORY NUMBER		
11	378.00	373.00
21	260.00	240.00
31	*	*
41	*	*
61	39.80	388.00
71	123.00	235.00
81	*	*
91	*	*
101	*	*
111	*	*
121	272.00	280.00
131	*	*
141	*	*
151	*	*
171	240.00	268.00
181	*	*
191	296.00	314.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-35.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:PID

RAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00	32.00	27.00
11	38.50	15.50			39.40	22.70	45.20*	56.70*	43.20*	58.60*	49.00*	47.70*
21	20.30	20.30	17.00	22.30	31.70	22.90	50.50	21.00	0.00*	6.10*	0.00*	0.00*
31	21.70	14.20	22.00	19.20	23.40	18.40	35.90	27.10	28.40	24.60	22.00	16.50
41	383.00*	23.20	20.40	9.41	23.70	33.70	29.30	14.40	44.30	50.00	33.00	0.00*
61												
71	15.80	16.80	40.60	35.50	39.90	58.10	34.60	37.40	17.00	18.70	37.80	41.60
81	7.66	0.00*	31.50	31.60	29.40	19.70	30.00	36.90	26.00	13.50	26.90	14.60
91	25.11	21.11	20.09	18.84	18.26	18.20	15.42	18.18	22.11	20.54	12.44	15.44
101	18.40	15.70	24.90	22.30	28.30	17.40	47.00	0.00*	0.00*	0.00*	28.30	22.40
111	0.00*	26.70	0.00*	25.60	68.20	25.20	106.00*	43.40	66.70	28.60	98.20*	17.60
121	34.40	28.60	49.90	36.10	31.70	32.10	27.50	26.40	56.90	47.10	51.50	27.30
131	58.70*	50.70	49.90	36.10	57.10	55.00	80.50*	100.90*	51.80	37.40	44.90	31.10
141	28.40	18.60	33.10	19.90	33.30	4.10	49.20	8.20	29.20	26.00	30.20	35.10
151	34.00	34.00	12.00	0.00*	27.00	0.00*	27.40	26.00	63.00	38.00	12.00	72.00
171	0.00*	0.00*	28.50	33.20	32.40	25.90	30.30	19.00	15.50	11.40	44.10	45.40
181	9.80	0.20	20.30*	11.20*	12.40	21.10	23.70		12.20*	19.70*	50.70	73.20
191	25.30	24.40	29.50	20.50	17.90	25.10	37.20	25.90	39.90	41.80	25.60	21.80
201				231.00*					284.00*	276.00*		
211	16.70	5.50	45.70	43.10	52.00	34.50	54.90	72.10*	89.50	100.00*	76.00	69.20
221	23.80	0.00*	36.30	33.30	34.30	32.80	37.00	13.30	21.70	25.30	25.00	30.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-35. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID

RAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER	32.00	27.00
11	38.00	36.50
21	16.50	16.50
31	*	*
41	*	*
61	*	*
71	9.24	16.90
81	*	*
91	*	*
101	*	*
111	*	*
121	47.90	13.00
131	*	*
141	*	*
151	*	*
171	2.22	1.94
181	*	*
191	29.20	22.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-36.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIFID

RAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNGER PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	294.00	292.00*			206.00	193.00	279.00*	224.00*	351.00*	222.00*	340.00*	320.00*
21	24.00	103.00	54.60	115.00	54.80	84.50	41.50	60.50	63.40*	75.40*	66.00*	99.00*
31	119.00	115.00	149.00	136.00	86.90	119.00	42.10	174.00	51.50	126.00	13.00	146.00
41	164.00	65.40	161.00	93.80	264.00	115.00	65.10	140.00	121.00	273.00	180.00	140.00
61	150.00	93.80			84.00*		177.00	211.00	109.00	102.00	103.00	108.00
71	96.10	102.00	124.00	7.86	100.00	139.00	105.00	166.00	92.60	122.00	123.00	118.00
81	81.00	128.00	176.00	161.00	211.00	108.00	210.00	163.00	168.00	165.00	150.00	62.70
91	178.16	175.40	108.23	158.43	100.09	159.13	83.92	159.43	101.21	183.08	91.81	102.15
101	94.90	102.00	99.60	94.40	88.90	87.80	47.00	3.00*	118.00	106.00	121.00	114.00
111	151.00	103.00	148.00	126.00	163.00	109.00	234.00	20.90	156.00	161.00	0.00*	67.40
121	134.00	136.00			134.00	146.00	186.00	134.00	183.00	156.00	174.00	116.00
131	161.53	116.70	128.50	110.50	145.50	130.70	147.40	106.90	136.00	102.10	74.70	101.00
141	223.00	128.00	147.00	124.00	174.00	87.20	144.00	165.00	138.00	127.00	143.00	118.00
151	183.00	121.00	198.00	61.00	193.00	50.00	204.00	83.00	220.00	77.00	94.00	85.00
171	46.10	78.23	187.00	83.50	123.00	111.00	212.00	148.00	217.00	91.80	248.00	197.00
181	36.70	97.40	71.30*	75.00*	75.20	57.40	136.10	196.00	104.50*	64.80*	134.10	133.10
191	144.00	139.00	128.00	110.00	128.00	121.00	152.00	146.00	220.00	122.00	163.00	143.00
201	309.00*	337.00*	411.00*	313.00*	317.00*				276.00	300.00	325.00*	
211	124.50	81.40	30.70	194.30	169.90	200.70	102.40	196.80	99.30	189.50	133.30	142.10
221	117.00	98.80	156.40	123.50	171.90	113.10	161.40	99.90	159.90	120.00	170.20	129.30

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-36. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSFID
 RAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	3	5
11	150.00	136.00
21	281.00	149.00
31	137.00	93.40
41	*	*
61	374.00	306.00
71	96.00	23.10
81	*	*
91	*	*
101	*	*
111	*	*
121	169.00	105.00
131	*	*
141	*	*
151	38.10	16.90
171	*	*
181	114.00	128.00
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-37.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISFID

PAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00	320.00	272.00
11	679.00*	502.00*			490.00	393.00	764.00*	558.00*	570.00*	747.00*	679.00*	618.00*
21	179.00	166.00	191.00	255.00	164.00	127.00	69.50	134.00	176.00*	145.00*	230.00*	167.00*
31	373.00	281.00	321.00	279.00	339.00	298.00	487.00	281.00	324.00	303.00	274.00	305.00
41	193.00	216.00	245.00	243.00	380.00	314.00	327.00	313.00	440.00	541.00	319.00	343.00
51	143.00	125.00			250.00	98.90*	436.00	*	289.00	261.00	359.00	331.00
61	265.00	243.00	3.07	6.05*	47.00	139.00	290.00	232.00	254.00	161.00	311.00	171.00
71	294.00	234.00	467.00	234.00	138.00	271.00	382.00	446.00	394.00	336.00	141.00	227.00
81	308.99	158.99	219.36	196.09	199.95	312.26	219.29	102.11	228.39	183.11	186.49	166.67
91	320.00	20.20	359.00	191.00	304.00	205.00	178.00	0.00*	147.00	202.00	249.00	205.00
101	309.00	197.00			340.00	212.00	373.00	69.40	321.00	205.00	348.00	238.00
111	314.50	233.20	277.10	252.70	276.40	237.70	263.00	237.50	405.00	198.00	282.00	263.00
121	311.00	265.00	322.00	272.00	513.00	405.00	307.00	149.00	328.00	152.00	189.40	212.00
131	248.00	157.00	154.00	352.00	303.00	275.00	308.00	66.00	275.00	237.00	319.00	263.00
141	213.00	283.00	455.00	391.03	149.00	144.00	216.00	205.00	369.00	237.00	356.00	427.00
151	282.00	172.00	50.40*	140.00*	213.00	139.00	412.90	178.00	163.10*	102.70*	365.10	228.00
161	328.00	302.00	296.00	250.00	260.00	220.00	294.00	279.00	364.00	255.00	321.00	272.00
171	280.00*	390.00*	900.00*	550.00*		*	536.00	328.00	268.00	521.00	*290.00*	669.00*
181	260.40	163.00	181.40	227.50	456.70	302.40	442.10	307.20	377.80	285.00	369.90	345.70
191	276.90	191.70	322.90	227.70	356.70	249.70	367.40	268.40	357.40	267.80	386.00	259.30

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - MON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-37. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I N V S: PAGE 529

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID

RAW DATA FOR 2,4-DINITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER		
11	320.00	272.00
21	921.00	426.00
31	228.00	183.00
41	*	*
51	25.83	180.00
61	130.00	47.70
71	*	*
81	*	*
91	*	*
101	*	*
111	279.00	182.00
121	*	*
131	*	*
141	*	*
151	177.00	144.00
161	374.00	298.00
171	*	*
181	*	*
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-38.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 24

EPA METHOD VALIDATION STUDY-IT ENV PHENOL:SEC

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
11	4.03	4.39	0.00*	0.00*	5.30	2.20	0.21	0.21	0.37	0.00*	17.60	0.00*
21	6.44	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
31	5.90	6.11	6.19	5.77	5.00	4.67	6.13	6.28	10.90	9.93	9.41	10.40
41	24.60*	15.50	15.10	7.09	17.20	12.90	19.20	26.80*	26.70	8.93	22.30	13.00
61	16.30	10.80	0.00*	0.00*	11.70	8.67	7.95	4.11	10.80	16.90	1.30	0.00*
71	2.00	2.43	0.00*	0.00*	0.67	10.40	7.91	7.04	5.73	5.31	7.99	5.31
81	5.63	3.55	7.77	0.15	8.46	7.60	10.50	14.60	6.31	4.44	5.76	4.46
91	3.60	4.70	0.76	3.25	2.43	2.07	0.84	1.11	3.29	3.88	2.64	2.42
101	8.64	5.66	0.00*	0.00*	5.70	4.85	4.39	5.35	2.29	0.00*	9.26	5.74
111	0.60*	3.20*	0.81*	0.00*	0.00*	5.61*	0.00*	0.00*	0.00*	0.00*	1.61	9.20
121	25.60*	24.10*	0.00*	0.00*	3.34*	23.80	15.10*	0.00*	26.20	23.60	17.40	6.18
131	4.10	6.40	0.00*	0.00*	5.80	71.00*	14.40	8.30	8.50	3.70	0.00*	0.00*
141	12.70	0.00*	15.00	16.80*	15.90	10.20	16.90	13.60	18.40	16.50	3.90	2.13
151	0.00*	0.00*	2.50	1.00	0.00*	0.10	1.80	0.30	4.40	0.00*	1.80	0.00*
171	3.47	6.62	0.00*	0.00*	5.75	2.57	6.70	5.22	7.31	6.09	5.54	5.34
181	1.45	34.70*	0.00*	0.00*	27.40*	29.60	41.80*	0.95	35.00	33.10*	33.10*	45.60*
191	8.81	15.90	6.30	4.67	4.73	3.62	4.36	3.72	7.28	4.21	1.04	2.46
201	0.00*	0.00*	0.00*	0.00*	0.00*	1.60*	1.70	0.40	5.40	0.00*	1.70	0.00*
211	8.60	5.40	0.00*	0.00*	9.00	4.90	0.00*	0.00*	14.60	10.00	8.30	38.20*
221	5.10	0.70	0.00*	0.00*	0.00*	9.40	7.90	0.00*	8.20	6.50	0.00*	6.60

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-38. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SIEC

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
	20.40	19.40
LABORATORY NUMBER		
11	2.56	2.19
21	9.41	6.21
31	*	*
41	*	*
61	11.70	10.10
71	2.42	2.79
81	*	*
91	*	*
101	*	*
111	*	*
121	6.47	7.53
131	*	*
141	*	*
151	*	*
171	7.60	6.95
181	*	*
191	22.60*	31.90*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-39.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUDEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20	101.00	91.20
11	19.10	22.50	27.50	*	9.50	9.60	37.50	39.80	7.85	5.60	14.80	7.60
21	0.00*	33.60	27.50	55.40	0.00*	12.10*	0.00*	33.70	27.00	29.70	0.00*	11.00*
31	38.80	35.30	51.70	36.20	23.60	37.10	8.72	43.70	13.30	46.10	0.00*	33.00
41	62.90	82.30	22.20	0.00*	44.30	51.30	90.40*	35.80	34.40	61.90	40.70	81.30
61	27.50	26.90	*	*	28.20	29.40	26.60	13.40	42.60	43.10	27.20	17.90
71	62.30	53.80	1.60*	*	32.20	35.70	26.00	18.30	22.60	64.40	48.00	34.70
81	39.00	50.13	14.20	26.10	25.60	24.30	17.20	17.70	19.40	18.80	7.94	10.20
91	35.20	44.04	29.53	40.45	24.82	47.88	26.97	66.64	44.62	62.35	14.92	26.11
101	31.20	32.50	17.80	8.24	19.20	26.60	52.60	5.14	37.40	39.70	25.30	34.50
111	0.60*	0.00*	0.00*	0.00*	3.01*	0.00*	0.00*	2.51*	1.10*	0.00*	7.10	10.90
121	63.20*	51.40*	*	*	36.20	41.80	86.90*	83.20*	36.00	55.80	23.00	38.20
131	19.70	15.70	49.40	25.70	10.50	22.90	13.30	7.40	16.00	8.30	53.10	32.20
141	20.40	22.40	0.00*	0.00*	45.40	50.00	38.50	39.80	27.40	48.00	135.00*	8.00
151	231.00*	12.00	0.00*	3.04	308.00*	4.90	17.00	59.00	424.00*	0.00*	25.00	12.80
171	47.00	35.80	3.60	0.00*	16.80	40.80	30.40	17.50	33.70	39.00	49.40	81.70
181	54.50	64.00	*	*	64.80	35.00	24.10	104.00*	34.30	52.30	25.00	13.90
191	42.80	40.70	23.30	31.20	*	26.80	17.80	22.10	32.20	21.30	12.10	72.60
201	*	*	26.70	47.30	*	59.10*	42.90	47.30	78.00*	101.00	33.40	43.70
211	40.50	15.80	2.28	*	32.40	52.50	29.60	24.50	4.00	104.00	39.20	38.40
221	47.00	*	40.80	15.20	40.00	33.00	46.00	34.00	*	52.60		

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-39. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--TF ENV PHENOLSTEC
PAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	3	5
LABORATORY NUMBER	101.00	91.23
11	9.90	23.20
21	20.00	63.40
31	*	*
41	*	*
61	22.10	18.60
71	21.80	23.30
81	*	*
91	*	*
102	*	*
111	*	*
121	43.50	44.10
131	*	*
141	*	*
151	*	*
171	35.70	33.30
181	*	*
191	20.00	70.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-40.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

FPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00	252.00	228.00
11	109.00	156.00	*	*	83.90	239.00*	239.00*	233.00*	54.70	95.20	119.00	107.00
21	91.20	173.80	90.00	124.00	69.90*	125.00	93.70	93.70	95.00	95.00	13.50*	49.80*
31	128.00	91.00	129.00	140.00	97.40	97.40	85.10	85.10	157.00	157.00	95.80	122.00
41	59.40	20.10	30.30	32.00	132.00	52.20	40.10	88.10	92.40	78.90	147.00	79.00
51	66.40	68.80	*	*	73.00	59.40	30.80	31.80	73.40	54.70	67.80	35.40
61	98.70	74.80	*	*	40.40	97.20	107.00	76.00	80.60	55.90	74.20	65.40
71	55.90	77.00	233.00	32.50	60.50	67.50	13.40	22.20	74.40	31.60	59.20	54.70
81	117.27	87.52	100.50	90.65	96.67	92.54	105.32	83.34	146.57	122.19	52.82	28.91
91	79.00	72.40	94.10	32.90	126.00	70.20	129.00	5.59	51.50	106.00	79.00	99.00
101	4.51*	4.00*	0.60*	0.00*	2.90*	8.30*	0.00*	0.00*	0.00*	0.00*	10.40	0.00*
111	147.00*	134.00*	*	*	69.40	136.00	125.00*	112.00*	102.00	67.30	75.40	116.00
121	97.50	75.50	8.00	13.90	93.50	124.50	26.90	25.20	70.50	40.80	11.90	68.30
131	41.30	22.90	47.80	62.60	75.90	39.70	66.40	60.80	56.70	51.30	69.50	96.00
141	128.00	154.00	0.00*	0.00*	72.00	182.00*	74.00	118.00	120.00	124.00	48.00	96.00
151	96.50	105.00	22.50	18.50	64.30	95.30	76.00	51.80	105.00	88.70	66.90	38.80
161	3.99	64.20	*	*	130.00	100.00	49.90	4.30	87.20	90.20	128.00	0.00*
171	70.92	82.20	70.60	58.40	63.90	59.40	78.90	43.20	30.40	46.70	31.20	35.80
181	*	*	201.00	132.00	329.00*	*	67.50	179.00	150.00	160.00	390.00*	444.00*
191	39.80	49.00	17.10	16.00	92.40	88.40	88.30	89.50	114.50	53.20	82.10	96.00
201	206.40*	100.00	79.10	63.40	112.20	78.40	119.00	92.00	103.00	77.00	158.40	136.60
211												
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-40. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSPEC

RAW DATA FOR PHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER		
11	49.70	42.80
21	29.00	52.00
31	*	*
41	35.00	16.90
61	37.60	43.00
71	*	*
81	*	*
91	*	*
101	*	*
111	*	*
121	95.20	116.00
131	*	*
141	*	*
151	*	*
171	133.00	114.00
181	*	*
191	228.00	170.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-41.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LOW YOUNG PAIR TRUE VALUE UG/L	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20	13.00	15.20
11	9.29	7.10	*	20.20*	5.19*	0.00*	12.00*	10.90*	10.60*	15.60*	10.40	1.92
21	4.30	5.04	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
31	4.39	4.31	0.00*	4.57	5.77	4.45	6.04	6.04	28.10*	0.00*	0.00*	0.00*
41	20.30	21.02*	10.20	3.81	19.70	14.20	17.60*	24.20	9.39	157.00*	0.00*	0.00*
61	9.88	7.69	*	8.90	4.45	3.17	7.38	3.10	2.56	6.67	6.67	*
71	12.40	3.94	*	8.11	11.90	6.30	7.13	6.60	6.20	18.40	5.61	1.17
81	3.94	2.08	3.72	12.50	22.20	10.10	8.94	12.60	13.00	3.70	1.17	1.17
91	1.19	1.71	3.54	0.79	0.86	2.08	3.86	0.65	1.11	1.08	0.64	0.64
101	20.80	9.21	0.00*	0.49	1.90	6.71	1.21	5.46	0.00*	0.00*	0.00*	0.00*
111	20.10	13.20	0.03*	1.31	15.60*	5.39	3.93	13.30	13.30	2.02	1.31	1.31
121	9.50	10.00	9.40*	14.30	14.60	19.40*	7.10	12.80	7.30	18.20	13.00	13.00
131	6.68	8.94	2.47	2.07*	2.92*	8.73	7.29	9.32	6.35	16.30	10.50	10.50
141	9.30	1.10	11.30	0.50	0.20	1.50	0.20	1.60	1.60	8.10	3.40	3.40
151	2.23	5.48	18.20	2.16	0.99	2.69	1.20	1.12	2.52	64.20*	10.20	10.20
161	2.03	26.40*	0.00*	26.70*	37.60*	48.40*	5.06	25.20*	39.00*	44.50*	44.50*	44.50*
181	6.62	7.14	1.04	3.77	4.68	2.92	3.22	1.99	2.60	7.31	14.40	14.40
191	*	*	*	3.40	20.70	0.00*	58.60*	0.00*	8.50	2.00	15.80	25.70
201	9.60	2.00	0.40	4.80	2.70	3.80	3.70	6.00	2.00	17.70	20.40	20.40
211	3.80	5.80	0.40	4.80	2.70	3.80	3.70	6.00	2.00	17.70	20.40	20.40
221	3.80	5.80	0.40	4.80	2.70	3.80	3.70	6.00	2.00	17.70	20.40	20.40

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-41.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 75

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSEC
RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

IN YOUDEM PAIR TUE VALUE UG/L	WATER TYPE	
	1	2
LABORATORY NUMBER		
11	13.00	15.20
21	14.50*	7.64*
31	1.16	2.92
41	*	*
51	8.28	6.11
61	10.60	11.00
71	*	*
81	*	*
91	*	*
101	4.75	7.65
111	*	*
121	*	*
131	*	*
141	6.80	5.25
151	10.40	11.70
161	*	*
171	*	*
181	*	*

* REJECTED
WATER LEGEND
P - TAP WATER - DC

TABLE A-42.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60	30.40	37.60
11	45.70	31.70	0.00*	13.80	45.10*	30.50*	59.20*	33.70*	47.00*	35.40*	42.20	20.90
21	0.00*	12.10	0.00*	12.50	0.00*	0.00*	0.00*	10.60	0.00*	0.00*	0.00*	0.00*
31	15.60	18.20	0.00*	12.50	8.78	19.30	3.92	23.30	7.46	18.70	0.00*	33.00
41	42.90	58.60	4.28	3.28	21.60	21.60	41.70	13.90	8.05	26.10	0.00*	0.00*
61	24.90	39.60	4.92*	3.28	16.70	31.50	11.90	9.20	8.57	10.70	0.00*	1.09
71	130.00*	29.20	4.92*	3.28	16.70	31.50	11.90	9.20	8.57	10.70	0.00*	1.09
81	15.50	13.50	51.10*	37.50	21.60	28.50	12.40	12.10	11.10	100.00	25.20	28.70
91	5.52*	6.84*	7.55	7.84	5.55	15.57	16.29	27.65	26.51	39.84	10.10	19.90
101	6.04	18.60	2.04	1.07	6.96	10.60	14.30	0.00*	0.00*	0.00*	0.00*	0.22*
111	11.50	7.70	4.21	6.41	14.60	13.30	29.50	30.80	25.50	19.60	24.10	24.60
121	40.10	38.90	20.70*	14.50*	30.50*	43.30*	25.60	28.40	11.70	19.70	27.70	33.60
131	67.50	24.40	20.70*	14.50*	22.60	27.80	25.80	13.10	21.10	16.90	12.80	40.70
141	10.40	14.60	5.50	2.86	3.50*	8.09*	4.80	15.60	6.31	21.50	27.10	27.60
151	17.23	20.00	90.07*	29.00*	18.00	10.00	24.00	2.00	11.00*	19.00	25.00	14.00
171	21.40	24.30	1.65	1.93	8.64	24.10	8.94	5.68	6.47	8.64	6.00	101.00*
181	64.40	67.70	2.89	40.00	66.20*	36.80*	2.32	0.00*	34.30*	50.70*	66.60*	11.50
191	18.40	21.10	26.00*	11.90	19.90	39.50	6.13	11.20	6.20	4.37	9.04	47.20
201	15.70	5.00	1.80	1.80	8.40	27.00	19.90	2.90	22.00	87.50	16.00	47.20
211	17.30	25.20	6.60	7.60	7.60	13.30	7.10	7.50	0.00*	34.00	21.20	26.00
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-42. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD 30 VALIDATION STUDY-IT ENV PHENOL/SEC
 RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNGER PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER		
11	45.10*	74.40*
21	18.30	33.80
31	*	*
41	7.97	*
61	41.80	10.20
71	*	*
91	*	*
101	*	*
111	*	*
121	18.40	40.00
131	*	*
141	*	*
151	*	*
171	23.70	26.00
181	*	*
191	9.80	22.50
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-43.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSEC

RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	295.00*	213.00	*	*	317.00*	207.00*	377.00*	240.00*	323.00*	241.00*	380.00*	216.00*
21	24.10	49.00	27.70	64.60	0.00*	29.40*	36.60	41.00	0.00*	37.40*	0.00*	27.30*
31	98.90	93.00	93.00	74.20	62.10	75.50	85.10	85.10	50.80	119.00	66.40	89.70
41	42.90	18.90	6.84	0.00*	69.30	40.50	38.80	49.90	46.80	34.20	0.00*	0.00*
61	118.00	180.00	*	*	125.00	108.00	30.90	31.90	26.60	15.40	24.10	24.10
71	101.00	167.00	*	*	23.40	79.60	65.10	69.90	48.90	17.50	80.20	106.00
81	44.30	69.00	158.00*	64.90	67.40	77.40	57.90	171.00*	136.00	67.00	71.10	145.40
91	14.55*	10.26*	11.74	45.41	28.49	32.54	24.56	36.51	65.43	30.26	3.34	10.62
101	66.60	88.30	98.00	0.00*	4.60	22.30	44.60	60.20	8.90*	22.50*	0.00*	0.00*
111	29.50	24.90	13.50	11.40	44.00	19.60	33.40	63.30	28.90	32.90	40.80	20.20
121	120.00	129.00	*	*	93.00*	125.00*	46.30	104.00	73.50	108.00	90.10	54.00
131	157.00	117.60	83.00*	81.00*	108.00	136.00	137.50*	81.50	151.50	107.00	43.20	54.00
141	43.20	42.13	28.30	43.20	20.40*	13.30*	24.80	56.60	32.70	31.00	68.60	66.40
151	15.00	116.00	9.00	0.00*	28.00	77.00	19.00	78.00	19.00	108.00	9.00	6.00
171	58.30	89.20	2.35	33.30	21.10	97.40	35.70	72.70	53.20	53.30	4.70	18.20
181	6.67	77.00	61.00	1.03	125.00*	84.20*	91.60	5.06	83.70*	96.20*	26.50	0.00*
191	47.70	70.50	45.40	44.90	56.20	79.30	55.10	31.60	8.41	26.80	21.70	35.00
201	*	60.20	60.20	92.20	233.00*	*	28.20	243.00*	115.00	183.00	297.00*	372.00*
211	22.00	56.00	*	*	50.40	58.90	24.60*	47.30*	21.80	17.00	35.70	46.00
221	131.00	91.20	55.30	38.80	66.40	39.20	49.00	42.00	40.20	70.60	66.60	58.80

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-43. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSIIC
 RAW DATA FOR 2,4-DIMETHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	4	6
HIGH YOUNG PAIR TRUE VALUE UG/L	122.00	151.00
LABORATORY NUMBER		
11	402.00*	241.00*
21	3.28	14.60
31	*	*
41	*	*
61	26.40	10.40
71	32.10	56.30
81	*	*
91	*	*
101	*	*
111	*	*
121	103.00	154.00
131	*	*
141	*	*
151	*	*
171	111.00	132.00
181	*	*
191	100.00	102.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-44.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNGER PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60	12.20	14.60
LABORATORY NUMBER												
11	0.00*	0.00*	*	*	27.10*	0.00*	14.60	17.80	0.00*	0.00*	3.32	5.98
21	9.30	8.40	11.60	5.34	1.28	8.24	7.51	5.75	5.74	5.33	0.00*	7.34
31	5.26	5.11	6.67	5.54	3.33	3.31	6.46	6.38	17.90	20.50	9.73	8.74
41	13.40	11.30	14.50	12.20	7.00	13.30	15.30	15.00	22.80	6.85	262.00*	2.90
61	11.20	8.93	*	*	16.00	2.17	7.95	7.31	6.08	6.70	15.90	12.30
71	3.00	1.60	1.53	0.60	13.80	12.90	8.41	6.20	5.80	7.07	14.80	4.43
81	7.34	1.82	4.65	1.31	9.41	7.80	5.95	4.37	3.43	3.86	14.70	6.46
91	*	*	*	*	5.21	4.15	0.84	1.23	0.58	0.99	0.63*	2.54*
101	7.26	6.09	13.10	11.93	14.30	*	7.88	15.00	3.79	0.19	10.40	8.53
111	9.20	12.10	0.00*	12.50	3.00	5.71	6.30	2.60	4.10	16.50	7.60	23.80*
121	22.50*	12.20*	*	*	1.50*	9.87	6.40*	*	*	*	11.60	6.84
131	6.00*	5.18*	2.40*	1.90*	13.90	3.30*	6.40*	0.90*	8.63*	*	*	*
141	16.30*	13.90*	14.60	12.40	13.90	10.30	14.20	13.60	17.60	13.40	9.57	5.45
151	10.40	3.10	0.00*	3.00	2.30	1.40	1.90	0.70	1.30	5.10	3.20	6.20
171	3.50	5.60	11.10	9.69	7.71	3.08	3.60	2.88	7.33	5.53	*	*
181	3.19	34.10*	2.15	1.53	15.30*	31.20*	21.30	3.17	37.10*	36.20*	10.30	44.00*
191	5.29	5.76	6.82	6.15	5.08	4.65	5.98	3.03	7.98	6.11	4.99	4.39
201	*	*	*	*	7.70*	23.90*	0.80	211.00*	72.40*	20.10*	15.80*	7.20*
211	36.00*	7.50	5.10	4.60	10.10	13.10	0.80	0.00*	15.30	6.00	12.50	13.40
221	7.50	4.40	5.80	*	8.90	4.60	6.40	2.80	11.90	8.50	17.80	16.30

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-44. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
	14.60	12.20
LABORATORY NUMBER		
11	0.00*	0.00*
21	1.86*	2.51*
31	*	*
41	*	*
61	10.40	11.60
71	6.95	7.59
81	*	*
91	*	*
101	*	*
111	*	*
121	4.67	4.01
131	*	*
141	*	*
151	2.50	2.65
171	*	*
181	6.30	5.40
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-45.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSTEC

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOU DEN PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	37.00	30.40	17.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40	37.00	30.40
11	0.00*	0.00*	*	*	45.30	11.30	45.70	3.19	41.00	79.00	60.50	14.20
21	4.86	19.80	20.10	32.40	0.00*	15.70	9.78	20.20	25.10	17.20	10.30	14.40
31	22.40	26.40	46.70	30.90	6.66	9.91	4.62	18.40	11.00	25.80	2.87	39.20
41	31.00	38.20	41.80	56.30	20.20	17.70	42.90	14.70	16.30	25.00	6.00*	26.10
61	8.46	8.64	*	*	9.64	6.53	26.20	18.40	24.20	82.10	29.50	21.60
71	51.00	12.60	25.40	276.00*	22.00	25.60	16.60	11.50	13.50	77.30	24.00	18.20
81	15.00	34.30	13.00	62.50	28.40	17.10	16.50	12.10	43.30	20.00	4.33	11.10
91	4.06	33.11	5.25	27.61	5.25	24.59	4.98	26.25	12.41	43.52	1.70*	7.32*
101	15.20	22.50	33.60	39.00	18.10	11.70	22.60	*	4.79	4.20	19.70	13.60
111	16.50	14.70	0.30	75.60	14.50	19.70	13.70	19.80	63.20	58.30	61.60	97.40
121	53.70*	31.50*	*	*	33.60	32.10	16.80	26.10	8.70	*	31.60	19.60
131	2.60*	3.90*	*	1.90*	*	*	0.75*	*	*	*	*	*
141	36.10*	37.70*	40.70	24.80	36.90	34.20	26.40	37.60	26.00	34.30	40.30	26.80
151	8.80	12.00	13.00	0.00*	40.00	25.00	34.00	18.00	149.00*	11.00	28.00	0.00*
171	21.30	18.50	37.80	19.30	8.33	17.30	12.00	4.25	16.20	16.90	8.25*	*
181	61.50	72.90*	6.00	54.00	71.00*	33.70*	4.14	83.80*	36.20	58.70	18.70	88.60
191	16.70	15.90	15.80	13.10	*	16.00	11.50	13.30	25.20	11.60	10.50	11.20
201	*	28.20	28.20	40.10	*	38.30*	865.00*	7.70	45.30*	104.00*	*	114.00*
211	31.70	55.40	0.00*	16.00	24.90	20.00	38.10	22.70	0.00*	96.00	25.80	33.30
221	30.60	18.50	29.40	44.60	29.20	15.60	26.40	11.60	*	24.60	33.60	26.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-45. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC
 RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	3	5
	37.00	30.40
LABORATORY NUMBER		
11	115.00*	68.70
21	9.52*	10.10*
31	*	*
41	*	*
61	22.70	25.60
71	13.10	14.50
81	*	*
91	*	*
101	*	*
111	*	*
121	15.40	37.00
131	*	*
141	*	*
151	*	*
171	5.60	5.80
181	*	*
191	15.00	11.50
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-46.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLS:EC

RAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	185.00	152.60	195.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00	185.00	152.00
11	10.60*	0.00*	*	*	82.40	75.10	24.50	0.00*	30.00	79.00	35.50	14.20
21	113.00	86.00	111.00	126.00	107.00	89.60	143.00	108.00	84.00	92.00	81.80	90.10
31	176.00	166.00	151.00	182.00	53.80	48.00	117.00	77.70	123.00	174.00	131.00	125.00
41	63.20	21.70	61.60	75.70	84.30	44.50	51.20	67.20	94.90	55.20	124.00	44.00
61	68.30	59.90	*	*	65.70	51.30	126.00	97.90	94.50	69.60	124.40	76.20
71	106.00	119.00	14.70	144.00	59.60	114.00	137.00	88.10	115.00	32.50	93.70	97.70
81	33.50	72.70	142.00	94.90	56.30	74.40	57.90	85.60	90.70	38.30	69.20	73.20
91	50.47	44.82	43.76	44.14	34.18	42.92	36.49	44.86	108.51	88.42	14.01*	14.93*
101	112.00	80.40	149.00	127.00	208.00	103.00	129.00	1.16	174.00	66.10	81.00	82.40
111	71.30	80.90	78.80	229.00	86.30	85.30	49.10	50.10	61.70	101.00	243.00	7.40
121	212.00*	154.00*	*	*	164.00	174.00	172.00	144.00	123.00	87.00	184.00	222.00
131	141.00*	125.00*	119.00	130.00	188.00	60.00	141.00	132.00	126.00	98.10	135.00	124.00
141	52.00	94.00	14.00	185.00	78.00	310.00*	108.00	148.00	120.00	189.00	49.00	98.00
151	76.30	65.50	60.60	192.00	31.10	87.30	71.50	63.50	120.00	87.70	47.30*	29.80*
161	12.60	70.60	68.50	3.27	174.00*	119.00*	77.40	5.25	110.00	105.00	98.50	0.00*
191	74.20	71.10	82.40	58.60	84.40	57.00	75.90	48.50	53.90	60.20	53.30	50.00*
201	70.00	54.00	224.00	152.00	390.00*	139.40	39.10	317.00*	190.00*	183.00*	418.00*	461.00*
211	306.80*	123.60	60.60	135.30	123.20	139.20	122.30	133.30	150.70	22.50	85.60	118.00
221			149.60	123.20	156.00	127.80	159.00	112.60	146.20	114.00	217.40	171.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-46. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC
 PAW DATA FOR 2-CHLOROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER TYPE	
	4	5
11	185.00	152.00
21	86.20	61.40
31	21.20*	21.20*
41	*	*
61	64.70	23.40
71	82.00	83.80
81	*	*
91	*	*
101	*	*
111	*	*
121	182.00*	158.00
131	*	*
141	*	*
151	*	*
171	43.50	32.50
181	*	*
191	85.00	66.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-47.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 174

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSIIEC

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LOW YOUNDEN PAIR TRUE VALUE UG/L	30.00	36.00	30.00	36.00	30.00	36.00	30.00	36.00	30.00	36.00	30.00	36.00
21	13.20	13.20	*	*	40.10	20.10	14.80	20.30	29.00	23.50	32.10	4.03
22	16.20	22.90	16.60	12.40	12.00	20.90	13.40	16.20	12.10	16.50	5.13	14.50
31	11.30	12.50	16.00	9.02	14.40	18.10	19.60	19.20	41.10	57.30	20.50	31.30
41	25.10	34.30	29.80	19.30	10.00	27.10	25.00	36.00	42.60	18.50	26.70	36.50
61	12.20	16.10	*	*	22.50	16.20	12.58	19.10	9.97	13.80	19.80	16.94
71	9.10	7.94	3.09	1.50	31.40	40.30	22.50	27.30	18.40	19.20	23.90	11.80
81	6.90	4.51	3.19	1.79	13.50	8.54	7.72	7.81	22.50	23.90	35.20	3.68
91	3.80*	4.54*	3.43	4.08	2.21*	3.87*	2.27*	3.19*	2.54*	5.64*	12.82	4.25
101	21.50	21.30	5.93	11.60	29.80	7.90	13.20	7.30	0.49	0.62	26.70	30.30
111	20.20	20.30	14.40	3.91	11.60	7.90	13.20	7.30	5.70*	10.70*	11.80	8.80
121	47.10	28.40	*	*	50.20	45.60	39.50	11.50	11.60	26.30	28.90	30.10
131	16.40	26.80	15.97	58.03*	16.80	45.60	39.50	11.50	22.40	11.40	5.00	9.30
141	339.00*	376.00*	238.00*	286.00*	200.00*	272.00*	277.00*	231.00*	241.00*	295.00*	173.00*	169.00*
151	8.83	5.50	1.60*	2.00*	1.70*	0.40*	2.30	2.00	2.10	6.50	2.50	4.40
171	5.65	15.30	2.94	13.50	6.50	4.36	7.15	2.35	10.84	17.90	11.50	16.20
181	15.20	46.40	9.17	7.23	10.70	51.00	71.30*	13.80	53.90	59.60	66.50*	67.20*
191	22.50	26.30	15.00	15.10	16.00	16.20	17.90	13.80	19.00	23.70	11.00	19.20
201	*	*	14.00	16.60	28.70*	62.70*	41.10	52.70	43.40*	40.30*	28.70*	38.80*
211	12.00	13.80	17.80	19.80	7.90	21.30	4.00	4.90	11.60	10.80	7.70	6.80
221	36.20	34.20	43.40*	19.80	29.40	23.00	42.20	36.40	41.80	32.00	42.20	34.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-47. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 173

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSEC

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER	30.00	36.00
11	24.73*	16.20*
21	2.46*	4.63*
31	*	*
41	*	*
51	10.80	12.30
61	5.91	9.17
71	*	*
81	*	*
91	*	*
101	*	*
111	*	*
121	12.40	15.20
131	*	*
141	*	*
151	*	*
161	19.70	35.50*
171	*	*
181	11.00	14.10
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-48.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC
RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNGER PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	170.00	204.00	*	*	137.00	170.00	260.00*	246.00	178.00	202.00	188.00	11.80
21	19.10	90.80	64.70	109.00	28.40	84.90	41.70	122.00	93.10	69.30	30.40	57.50
31	83.40	132.00	147.00	108.00	60.30	130.00	26.70	158.00	35.90	136.00	5.66	131.00
41	138.00	200.00	51.60	34.00	82.30	42.70	163.00	61.30	90.00	113.00	43.00	178.00
61	120.00	180.00	*	*	91.80	95.90	132.00	87.70	77.10	99.60	104.00	82.20
71	179.00	108.00	92.80	130.00	128.00	180.00	73.60	91.00	98.00	233.00	124.00	95.50
81	37.40	55.20	62.60	30.50	67.00	91.30	56.40	62.00	148.00	178.00	0.92	109.00
91	33.30*	53.20*	31.14	45.52	28.63*	53.13*	26.31*	49.34*	63.36*	76.31*	22.54	50.73
101	96.10	171.00	91.60	60.50	111.00	107.00	163.00	9.23	116.00	153.00	87.60	142.00
111	48.00	28.90	71.00	36.30	45.80	27.90	38.20	10.20	28.70*	22.10*	22.30	29.20
121	209.00	189.00	*	*	161.00	222.00	80.40	125.00	134.00	92.50	126.00	139.00
131	256.50	261.00	179.50	181.00	210.00	331.50*	93.00	66.00	78.00	72.50	44.70	297.00*
141	120.00*	150.00*	150.00*	84.00*	100.00*	320.00*	773.00*	440.00*	887.00*	330.00*	100.00*	160.00*
151	182.00	10.00	47.00*	9.30*	36.00*	50.00*	15.00	58.00	339.00*	60.00	65.00	28.00
171	94.40	108.00	16.80	21.50	14.50	109.00	58.80	39.40	76.00	131.00	92.50	40.90
181	151.00	151.00	46.30	139.00	123.00	84.60	29.30	122.00	73.30	108.00	112.00	185.00
191	81.10	112.00	46.60	95.30	*	111.00	51.80	179.10	91.90	85.40	44.60	56.60
201	76.70	18.00	*	396.00*	25.00*	250.00*	116.00	159.00	204.00*	238.00*	*	225.00*
211	156.60	292.00	139.20	13.00	25.70	77.50	28.90	46.60	4.00	146.00	44.10	46.00
221					152.00	157.20	125.60	131.80	126.20	200.40	128.60	158.40

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - MON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-48. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER	150.00	180.00
11	160.00*	254.00*
21	27.30*	38.30*
31	*	*
41	*	*
61	43.60	31.70
71	52.70	68.50
81	*	*
91	*	*
101	*	*
111	*	*
121	73.30	183.00
131	*	*
141	*	*
151	*	*
171	97.50	122.00
181	*	*
191	38.20	62.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-49.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD 30 VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	5	4	5	4	5	4	5	4	5	4	5
HIGH YOUNG PAIR TRUE VALUE UG/L	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00	374.00	450.00
11	468.00	614.00	511.00	531.00	639.00*	669.00	518.00*	598.00	590.00*	622.00*		
21	130.00	197.00	194.00	255.00	169.00	204.00	297.00	319.00	137.00	230.00	98.50	196.00
31	375.00	341.00	390.00	373.00	284.00	302.00	341.00	354.00	259.00	476.00	246.00	346.00
41	106.00	47.10	104.00	87.50	206.00	107.00	94.90	154.00	179.00	123.00	220.00	153.00
51	263.00	398.00	308.00	306.00	306.00	274.00	167.00	247.00	179.00	192.00	190.00	279.00
61	266.00	387.00	43.40	96.80	128.00	361.00	267.00	260.00	227.00	161.00	243.00	315.00
71	50.60	392.00	340.00	374.00	128.00	148.00	132.00	228.00	243.00	153.00	174.00	248.00
81	104.65*	111.65*	73.15	84.75	91.47*	102.36*	89.25*	96.76*	148.82*	118.54*	98.67	111.42
91	310.00	345.00	191.00	243.00	267.00	329.00	359.00	37.10	194.00	300.00	264.00	308.00
101	219.00	171.00	171.00	85.70	209.00	138.00	162.00	163.00	41.90*	69.40*	121.00	51.00
111	359.00	359.00	335.00	335.00	428.00	428.00	222.00	314.00	242.00	285.00	284.00	
121	304.00	419.50	171.50	286.50	286.50	428.50	175.50	279.00	222.00	230.50	60.00	175.00
131	780.00*	810.00*	490.00*	870.00*	110.00*	740.00*	770.00*	890.00*	702.00*	580.00*	790.00*	
141	87.00	144.00	10.00*	25.00*	48.00*	234.00*	154.00	263.00	111.00	292.00	6.00	146.00
151	228.00	233.00	88.40	134.00	64.70	231.00	184.90	315.00	266.00	275.00	161.00	153.00
161	56.90	155.00	94.73	15.50	255.00	181.00	193.00	36.40	190.00	199.00	302.00	0.00*
171	154.00	226.00	173.00	177.00	186.00	231.00	222.00	137.00	112.00	180.00	103.00	143.00
181	136.00	106.70	55.63	231.00	753.00*	166.00	166.00	527.00	368.00*	521.00*	844.00*	160.00*
191	335.40	428.60	293.20	327.80	158.90	122.10	137.30	172.20	160.00	89.80	91.00	140.00
201					339.40	203.00	337.70	348.40	166.00	352.20	312.60	311.60
211												
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-49. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

RAW DATA FOR 4-CHLORO-3-METHYLPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER	
	4	6
HIGH YOUNG AIR TRUE VALUE UG/L	374.00	450.00
11	598.00*	625.00*
21	30.50*	54.60*
31	*	*
41	*	*
61	121.00	37.60
71	136.00	199.00
81	*	*
91	*	*
101	*	*
111	*	*
121	393.00	420.00
131	*	*
141	*	*
151	*	*
171	327.00	378.00
181	*	*
191	155.00	164.00
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-50.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 224

EPA METHOD VALIDATION STUDY-IT ENV PHENOLISIEC
RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUDEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00	14.80	17.00
11	15.70	16.20	9.27	7.63	22.80	11.10	11.60	13.10	19.60	13.00	17.70	9.17
21	10.10	12.40	4.75	5.98	3.82	12.20	7.30	8.20	5.06	7.86	1.48	10.60
31	5.16	6.38	14.30	14.30	7.66	7.41	7.80	7.53	29.00	35.50	11.50	13.60
41	10.60	13.00	10.50	9.60	5.28	11.70	12.50	16.60	19.60	9.29	74.50	22.10
61	4.04	6.20	5.14	1.43	7.96	7.86	11.20	12.70	5.62	10.80	16.30	11.20
71	5.33	6.78	2.25	3.64	18.50	24.40	15.50	17.00	11.90	9.31	16.90	7.00
81	4.23	2.22	13.20	17.90	15.80	8.56	10.00	15.00	37.50	13.60	32.20	7.41
91	2.92	0.94	5.00	4.01	2.33	2.86	1.83	5.24	2.45	2.94	2.59	2.70
101	4.05	2.04	11.20	11.20	11.20	1.11	11.80	10.40	0.00	0.00	1.20	0.80
111	1.90	0.00	9.70	13.00	0.40	25.80	4.23	7.27	2.00	8.21	0.61	2.71
121	31.20	18.80	9.70	12.10	10.50	29.90	25.80	17.50	15.50	8.60	5.90	6.60
131	11.70	16.72	9.90	9.20	7.60	10.30	11.20	10.20	9.32	11.30	8.13	9.25
141	16.00	14.30	3.20	3.80	7.80	1.30	9.70	1.70	1.10	9.70	2.80	8.20
151	5.70	4.40	9.20	11.70	10.70	6.16	10.40	11.40	9.37	11.80	9.80	13.90
171	12.90	4.60	9.04	9.97	45.20	29.00	64.50	13.90	48.68	4.80	55.30	62.50
181	12.90	46.30	9.16	13.40	9.30	11.00	11.00	12.20	21.10	11.40	9.97	11.10
191	15.30	7.43	3.50	0.80	11.50	41.80	22.20	3.00	11.10	10.50	13.30	17.70
201	3.00	10.60	2.50	6.90	7.60	9.30	0.00	4.90	11.80	1.60	8.30	9.60
211	22.90	22.90	15.13	15.80	11.60	10.60	15.20	15.80	11.60	17.40	12.50	20.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NOM DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-50. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-TT ENV PHENOLS:EC
 RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	1	2
LABORATORY NUMBER	14.80	17.03
11	17.20	10.30
21	4.67*	8.72*
31	*	*
41	*	*
61	7.02	11.00
71	166.00*	381.00*
81	*	*
91	*	*
101	*	*
111	*	*
121	6.63	8.84
131	*	*
141	*	*
151	*	*
171	7.50	11.00
181	*	*
191	12.70	16.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

 7 - TAP WATER - DC

TABLE A-51.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 226

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOU DEN PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00	112.00	129.00
11	168.00	180.00*			146.00	147.00	188.00*	194.00*	159.00*	172.00*	167.00	121.00
21	15.60	80.30	52.10	116.00	10.30	68.50	33.00	86.90	67.60	59.60	34.10	65.50
31	55.40	86.10	59.30	90.00	33.40	74.20	14.70	85.20	25.40	83.30	7.51	94.60
41	83.50	127.00	66.80	101.00	53.30	50.00	113.60	92.70	42.40	86.50	40.60	135.00
61	70.20	93.80			64.30	85.00	119.00	89.30	68.40	87.60	107.00	95.20
71	98.50	96.50	105.00	295.00	161.00	208.00	70.20	78.50	104.00	137.00	84.10	81.80
81	44.00	60.70	71.00	175.00	64.20	84.50	101.00	123.00	146.00	141.00	9.43	138.00
91	48.36*	73.38*	36.81	59.92	32.29	63.25	42.21	66.76	41.43	73.26	18.37*	23.62*
101	64.70	101.00	77.65	108.00	81.80	86.30	128.00		82.90	105.00	65.80	85.80
111	3.20*	0.00*	0.00*	1.41*	2.90*	1.41*	3.21*		17.10*	8.81*	1.71*	5.90*
121	221.00*	170.00*			152.00*	191.00*	69.90	158.70*	120.00	66.90	116.00	105.00
131	146.00	133.50	80.00	82.50	87.00	160.00	103.50	78.50	79.00	81.50	55.00	251.00*
141	68.60	87.50	74.90	70.70	75.70	83.00	58.70	91.80	56.80	77.30	66.90	74.20
151	120.00	86.00	84.00	25.00	48.00	63.00	99.00	63.00	214.00	59.00	78.00	38.00
171	92.50	101.00	54.70	45.20	35.90	97.00	66.40	43.40	70.40	97.50	75.90	42.90
181	308.00*	358.00*	177.00	330.00	146.00*	202.00*	45.00	234.00*	87.40*	267.00*	109.00	395.00*
191	66.90	93.50	53.20	82.90		89.60	55.40	78.20	81.40	77.20	53.50	73.50
201			102.00	160.00		195.00*	98.00	137.00	161.00*	195.00*		186.00*
211	67.60	82.00	14.60	100.90	47.20	149.20	37.10	57.20	4.20	130.00	48.40	84.20
221	155.60*	463.00*	144.70*	132.00*	160.20	155.60	143.60*	131.60*	145.20	167.00	142.20	164.10

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-51. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL:SEC

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE µG/L	WATER	
	3	5
LABORATORY NUMBER		
11	146.00	114.00
21	53.10*	62.40*
31	*	*
41	*	*
61	43.80	41.60
71	202.00	106.00
81	*	*
91	*	*
101	*	*
111	*	*
121	57.20	192.00
131	*	*
141	*	*
151	*	*
171	52.00	79.20
181	*	*
191	415.00*	92.50
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-52.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V 51 PAGE 228

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	4	6	4	6	4	6	4	6	4	6	4	6
11	244.00	293.00	*	*	261.00*	270.00	332.00*	342.00*	279.00*	323.00*	339.00	329.00*
21	114.00	124.00	104.00	104.00	104.00	114.00	146.00	143.00	73.50	122.00	91.10	136.00
31	207.00	154.00	184.00	189.00	110.00	109.00	148.00	129.00	114.50	205.00	136.00	169.00
41	69.50	30.20	65.90	102.00	84.10	58.60	54.50	94.80	115.00	86.20	149.00	90.00
61	132.00	179.00	*	*	151.00	148.00	148.00	174.20	123.00	126.00	181.00	152.00
71	160.00	172.00	109.00	211.00	83.90	247.00	186.00	174.00	152.00	160.00	102.00	137.00
81	53.20	414.00*	213.00	406.00*	91.10	98.42	81.44	82.54	62.51	112.56	93.70	177.00
91	106.50*	97.83*	112.84	72.33	98.42	88.43	81.44	82.54	62.51	112.56	36.42*	52.08*
101	147.00	147.00	131.00	164.00	148.00	164.00	176.00	2.10	104.00	136.00	122.00	130.00
111	1.41*	2.10*	2.40*	0.50*	1.12*	10.40*	0.00*	2.31*	16.13*	1.70*	7.20*	0.41*
121	289.00*	302.00*	*	*	285.00*	333.00*	210.00	242.00	117.00	101.00	301.00	89.00
131	190.00	211.50	96.00	139.50	127.50	241.00	162.00	141.50	161.50	171.00	48.00	129.00
141	119.00	129.00	108.00	129.00	126.00	69.90	118.00	129.00	106.00	87.90	125.00	99.00
151	82.00	106.00	27.00	116.00	93.00	330.00	114.00	258.00	116.00	323.00	194.00	83.40
171	143.00	166.00	148.00	176.00	43.20	162.00	108.00	144.00	150.00	167.00	94.90	0.00*
181	126.00	229.00	227.00	40.90	612.00*	397.00*	298.00	65.00	347.00*	353.00*	557.00*	0.00*
191	108.00	153.00	115.00	125.00	121.00	124.00	117.00	105.00	106.00	132.00	90.80	124.00
201	44.00	70.70	297.00	262.00	423.00*	*	246.00	324.00	208.00*	316.00*	485.00*	663.00*
211	260.00*	319.80*	73.40	98.70	116.80	130.30	107.40	111.20	100.00	88.20	80.00	118.00
221			259.40*	281.40*	166.40	273.40	282.60*	289.80*	256.20*	287.20	272.20	244.20*

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-52. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD 0 VALIDATION STUDY-IT ENV PHENOLSTEC
 RAW DATA FOR 2,4-DICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	6	7
	186.00	214.00
LABORATORY NUMBER		
11	369.00	393.00
21	32.50*	54.70*
31	*	*
41	*	*
61	87.70	24.10
71	144.00	213.00
81	*	*
91	*	*
101	*	*
111	*	*
121	343.00	315.00
131	*	*
141	*	*
151	*	*
171	123.00	135.00
181	*	*
191	165.00	182.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-53.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 274

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSLSEC

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
11	12.80	12.90	15.00	12.10	26.80	22.60	17.60	21.70	21.30	18.50	24.10	17.80
21	11.80	16.00	9.28	9.84	8.79	16.00	15.30	15.90	6.87	11.30	4.88	16.10
31	6.99	8.65	14.40	16.70	15.80	18.93	5.80	12.90	36.80	49.60*	12.30	18.50
41	4.85	6.83	7.77	2.80	16.12	14.50	13.70	10.17	26.80	11.40	4.90*	26.30
51	7.77	2.80	4.93	2.59	6.12	1.42	13.80	16.60	7.44	9.90	23.80	20.20
61	4.93	2.59	3.33*	4.71*	21.10	24.90	13.00	15.60	12.80	9.70	18.00	7.88
71	3.33*	4.71*	15.00	13.20	3.95*	10.30	5.25	7.89	2.93	10.20	66.40*	6.64
81	15.00	13.20	21.10*	51.90*	1.16	3.12	3.08	3.87	3.39	6.51	12.62	4.26
91	21.10*	51.90*	16.20	17.50	12.90	15.50	15.50	14.10	0.00*	0.00*	15.70	17.10
101	36.10*	27.30*	16.20	17.50	3.11	21.10	27.40	15.70	19.50*	40.70*	15.40	32.10
111	17.30	25.10	16.50	18.90	16.30	35.40*	7.57	7.19	6.83	15.80	29.60	21.60
121	24.40	28.00	21.80	22.80	16.10	43.50	36.60	18.80	20.00	11.60	8.60	9.70
131	12.80	4.13	8.70	5.30	18.90	16.10	23.60	20.90	19.10	23.80	21.50	22.50
141	3.08	7.89	12.60	15.03	15.20	3.00	1.80	5.90	1.60	10.30	5.30	6.80
151	46.80*	76.70*	47.00*	43.00*	22.60*	46.50*	11.40	34.40	12.80	14.90	14.50	18.00
161	20.20	11.70	16.00	20.70	13.10	16.70	120.00*	47.40*	78.80*	89.80*	91.80*	84.80*
171	13.80	11.60	41.80*	50.40*	16.20	52.80	14.70	17.20	15.60	20.40	14.40	15.00
181	13.80	11.60	12.20	16.80	8.80	10.60	29.70	35.90	30.90*	24.80*	17.50	23.60
191	20.20	31.60	21.60*	42.60*	25.20	51.80	0.00*	5.00*	12.00	21.40	12.70	13.50
201							23.30	30.30	20.00	26.60	21.00	29.80
211												
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-53. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD VALIDATION STUDY-IT ENV PHENOL:SEC
 PAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD VALIDATION STUDY-IT ENV PHENOL:SEC
 PAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
	20.40	23.60
LABORATORY NUMBER		
11	21.30	17.90
21	4.47*	9.69*
31	*	*
41	*	*
61	8.41	13.90
71	12.40	17.20
81	*	*
91	*	*
101	*	*
111	*	*
121	14.80	20.70
131	*	*
141	*	*
151	*	*
171	10.80	16.90
181	*	*
191	17.70	20.70
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-54.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 276

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSI SEC

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00	50.20	59.00
11	36.20	41.50			36.90	34.90	44.40	45.80	39.60	41.10	43.90	38.20
21	5.77	40.10	25.40	*	7.60	32.30	14.70	41.50	31.00	26.90	19.10	38.00
31	28.60	45.60	51.40	47.90	14.00	32.70	7.49	38.00	14.60	39.40	18.00	55.50
41	36.60	56.50	52.70	88.30	25.00	13.90	49.80	35.60	20.30	42.40	23.10	61.60
61	34.90	55.50		*	21.80	30.90	64.70	49.20	25.30	84.80	44.10	37.30
71	118.00*	33.90	70.10	354.00*	40.40	50.90	20.70	26.30	29.40	117.00	33.50	36.60
81	20.30	60.60	26.10	55.70	25.60	32.70	29.30	29.60	69.30	36.80	10.00	41.80
91	17.65*	28.20*	22.20*	46.27*	22.76	42.99	33.36	50.99	24.82	55.24	22.94	50.75
101	34.50	45.10	36.00	46.10	28.20	32.80	46.60		38.80	42.70	34.50	37.90
111	138.00*	98.00*	41.00	70.80	149.00*	165.00*	145.00*	111.00	206.00*	201.00*	150.00*	232.00*
121	105.00*	94.90*		*	81.60*	115.00*	46.30	101.00	39.10	35.30	70.40	59.30
131	57.00	56.00	34.40	38.20	37.00	65.00	41.80	33.80	31.80	33.10	24.10	100.00*
141	47.60	59.70	52.80	61.30	44.10	50.60	43.80	68.40	42.70	58.50	44.90	54.90
151	48.00	96.00*	57.00	21.00	57.00	8.40	25.00	28.00	45.00	28.00	28.00	16.00
171	44.00	46.60	31.40	23.20	18.00	47.80	28.90	21.20	30.30	34.30	34.00	22.00
181	690.00*	221.00*	529.00*	294.00*	197.00*	90.10*	54.40*	499.00*	89.90*	178.00*	93.00*	*350.00*
191	32.20	45.40	32.40	42.00	*	44.50	29.40	29.40	38.60	28.40	35.80	36.90
201		*	107.00*	141.00*	*	75.70	23.60	43.10	62.60*	91.80*	*	61.40
211	34.70	31.00	4.80	63.60	18.00	45.00	11.90*	29.20*	8.00	130.00	24.60	33.40
221	60.40	65.40	91.60*	128.70*	80.20*	70.60	56.00	55.00	54.80	65.40	58.00	64.80

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-54. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSEC
 DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
	50.20	50.00
LABORATORY NUMBER		
11	37.30	86.70
21	31.30*	34.10*
31	*	*
41	*	*
61	31.90	36.30
71	39.80	40.20
81	*	*
91	*	*
101	*	*
111	*	*
121	31.60	105.00
131	*	*
141	*	*
151	*	*
171	32.20	47.60
181	*	*
191	35.30	45.50
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-55.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	137.00	200.00	*	*	156.00	173.00	181.00	218.00	174.00	205.00	155.00	202.00
21	124.00	140.00	121.00	196.00	118.00	134.00	135.00	164.00	76.20	139.00	132.00	189.00
31	245.00	156.00	145.00	230.00	108.00	120.00	166.00	142.00	121.00	226.00	170.00	197.00
41	68.00	30.90	40.90	183.00	92.60	49.60	49.90	116.00	131.00	110.00	183.00	111.00
61	123.00	176.00	*	*	142.00	131.00	177.00	184.00	108.00	124.00	218.00	176.00
71	150.00	198.00	46.50	274.00	73.90	193.00	126.00	110.00	118.00	50.00	106.00	160.00
81	12.80	356.00	234.00	390.00	78.80	83.30	107.00	231.00	187.00	89.30	69.00	205.00
91	96.12*	89.48*	90.32*	84.67*	78.54	128.15	75.29	73.36	108.47	105.12	98.67	111.42
101	156.00	158.00	61.00	166.00	141.00	150.00	176.00	3.78	113.00	145.00	129.00	153.00
111	345.00*	400.00*	227.00	251.00	299.00*	269.00	233.00	323.00	196.00*	264.00*	351.00*	125.00
121	416.00*	516.00*	*	*	457.00*	524.00*	270.00	430.00	144.00	112.00	*	*
131	190.00	212.00	101.50	173.50	134.00	247.50	198.50	140.00	161.50	172.50	93.50	98.50
141	198.00	226.00	181.00	225.00	169.00	124.00	194.00	226.00	170.00	138.00	198.00	212.00
151	91.00	141.00	3.60	285.00	69.00	205.00	126.00	116.00	114.00	345.00	91.00	128.00
161	144.00	189.00	183.00	196.00	44.80	191.00	110.00	169.00	154.00	202.00	107.00	95.00
171	244.00	115.00	210.00	181.00	*010.00*	*393.00*	268.00*	400.00*	419.00*	*440.00*	625.00*	0.00*
181	138.00*	173.00	*	134.00	152.00	143.00	124.00	149.00	136.00	158.00	153.00	183.00
191	40.00	72.00	463.00*	354.00*	421.00*	95.50	299.00	209.00*	209.00*	317.00*	445.00*	685.00*
201	270.00	285.40	235.20*	311.40*	236.20	304.00	237.80	247.40	51.40	248.20	212.80	240.20
211	40.00	72.00	73.10	93.30	106.40	159.60	77.90	113.20*	109.10	35.00	105.00	126.20
221	270.00	285.40	235.20*	311.40*	236.20	304.00	237.80	247.40	51.40	248.20	212.80	240.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-55. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSTEC

RAW DATA FOR 2,4,6-TRICHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	4	6
LABORATORY NUMBER	200.00	236.00
11	240.00	254.00
21	55.00*	77.30*
31	*	*
41	*	*
61	108.00	32.20
71	130.00	166.00
81	*	*
91	*	*
101	*	*
111	*	*
121	*	*
131	*	*
141	*	*
151	*	*
171	155.00	164.00
181	*	*
191	183.00	189.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-56.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SIEC

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LABORATORY NUMBER	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20	17.80	16.20
11	13.20	7.50	*	*	20.40	13.60	16.10	11.20	13.20	13.80	17.20	13.20
21	14.90	14.90	9.44	9.44	8.42	9.72	4.00	0.00*	11.40	15.40	4.02	9.42
31	6.74	6.22	9.63	5.97	9.23	6.36	16.00	0.00*	13.80	16.40	13.20	6.82
41	9.86	8.91	11.70	8.60	3.95	9.26	0.00*	0.00*	23.00	3.87	36.40*	18.20
61	13.00	13.20	*	*	15.20	6.24	14.10	82.40	12.70	9.64	27.80*	18.20
71	3.21	8.89	16.40	14.10	10.80	9.18	67.40	55.50	6.78	6.33	13.00	8.94
81	0.00*	4.89	2.45*	1.44*	86.00*	2.57	161.00	159.00	0.00*	0.00*	4.66	114.00*
91	5.48	5.12	5.62	7.17	3.89	7.85	5.28	6.91	5.62	7.23	3.38	8.13
101	13.00	11.20	1.95	1.86	4.61*	*	116.00*	70.70*	0.00*	0.00*	0.00*	0.00*
111	21.70	39.80*	6.61	20.90	3.42	5.00	6.81	5.11	4.20	7.62	7.11	4.90
121	33.00*	21.50*	*	*	*	*	*	*	16.60	15.20	12.80	21.70
131	13.80	15.80	13.30	11.30	13.00	24.40*	131.50	*	13.70	15.20	9.10	*
141	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	32.00	0.00*	0.00*	0.00*	0.00*	0.00*
151	9.10	7.20	4.80	18.70	1.40	2.40	47.00	24.00	5.80	14.40	3.40	12.00
171	*	*	4.03	12.10	14.30	7.85	60.00	50.00	17.00	12.50	13.60	14.50
181	72.60*	109.00*	132.00*	51.00*	55.50*	108.00*	141.00	107.00	112.00*	53.40*	123.00*	79.40*
191	15.00	14.90	13.10	13.00	11.80	9.98	*	15.10	16.10	13.20	13.10	11.00
201	*	*	7.50	7.50	7.50	*	16.80	67.70	16.80	30.70*	7.50	7.50
211	2.00	11.20	4.50*	6.00*	7.20	2.10	11.40	11.50	3.80	58.00*	2.70	2.80
221	8.10	10.30	11.90	15.60	7.70	12.40	12.60	*	10.30	12.80	15.70	14.50

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-56. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SPEC

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	1	2
LABORATORY NUMBER	17.80	16.20
11	16.50	15.20
21	5.66*	4.37*
31	*	*
41	*	*
61	14.10	15.60
71	15.00	12.00
81	*	*
91	*	*
101	*	*
111	*	*
121	18.60	20.40
131	*	*
141	*	*
151	*	*
171	2.75*	3.65*
181	*	*
191	19.00	13.10
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-57.
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I N V S: PAGE 326

FPA METHOD VALIDATION STUDY-17 ENV PHENOLSI/EC
PAU DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	136.00	103.00			92.40	67.90	244.00	141.00	81.50	65.20	120.00	92.40
21	23.90	76.90	69.00	124.00	25.50	40.60	26.00	36.00	72.50	71.80	39.20	66.20
31	78.40	97.90	107.00	79.50	59.10	114.00	0.00*	371.00	33.60	86.50	20.40	53.00
41	108.00	109.00	84.30	74.70	64.30	37.20	0.00*	0.00*	47.90	86.70	56.40	121.00
61	104.00	114.00	137.00	228.00*	91.20	66.40	387.00	190.00	99.60	93.60	143.00	99.90
71	68.90	77.50	0.00*	39.83*	60.70	54.10	121.00	76.30	48.00	57.70	45.50	46.80
81	78.30	101.00	52.22	54.65	49.70	31.80	192.00	179.00	53.80	54.80	28.80	9.94
91	63.42	36.51	47.10	40.60	59.23	88.76	52.91	53.23	85.64	86.23	49.83	57.83
101	94.80	101.00	9.91	68.50	11.80*	13.30*	498.00*		61.70*	58.70*	2.50*	2.50*
111	55.60	18.90			3.62	36.70	43.70	71.10	60.10	93.10	23.30	54.50
121	187.00*	134.00*			129.00	208.00	30.00	217.00	54.50	96.20	114.00	86.40
131	198.50	150.00	115.00	86.50	124.50	133.50	217.00		101.60	94.50	81.50	232.00*
141	130.00	47.10	108.00	122.00	96.00	114.00	0.00*	171.00	129.00	89.30	124.00	113.00
151	149.00	44.00	125.00	58.00	53.00	5.80	154.00	86.00	115.00	34.00	32.00	19.00
171	64.80	82.00	96.20	46.50	50.20	106.00	89.50	100.00	91.70	97.20	95.70	41.70
181	807.00*	918.00*	777.00*	871.00*	431.00*	555.00*	257.00	176.00	217.00*	547.00*	859.00*	762.00*
191	93.90	112.00	91.10	89.60		112.00	13.20	91.00	107.30	112.00	111.00	110.00
201			7.50	160.00		114.00	53.80	40.00	165.00	90.90		40.40
211	196.30	10.00	0.80*	51.30*	19.20	84.00	134.90	30.50	2.40	116.80	30.00	32.00
221	123.40	77.00	140.00	95.00	140.00	114.60	129.40	346.60	122.80	109.60	134.40	109.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-57. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSTEC

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
LABORATORY NUMBER		
11	92.40	84.20
21	60.30*	57.70*
31	*	*
41	*	*
51	130.00	81.80
71	100.00	101.00
81	*	*
91	*	*
101	*	*
111	*	*
121	123.00	128.00
131	*	*
141	*	*
151	*	*
171	72.10*	52.70*
181	*	*
191	124.00	112.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-58.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00	226.00	202.00
11	207.00	193.00	*	*	152.00	177.00	353.00	214.00	133.00	109.00	174.00	166.00
21	138.00	122.00	156.00	183.00	137.00	100.00	81.00	81.00	121.00	173.00	103.00	98.80
31	171.00	97.13	193.00	170.00	190.00	129.00	351.00	128.00	101.00	182.00	148.00	102.00
41	93.40	29.30	71.90	106.00	119.00	45.10	0.00*	0.00*	145.00	107.00	208.00	106.00
51	170.00	174.00	*	*	192.00	149.00	393.00	298.00	184.00	137.00	25.10	169.00
71	191.00	152.00	76.23	135.00	41.40	55.40	122.00	38.30	78.80	85.90	67.60	58.40
81	114.00	124.00	120.00*	32.40*	54.70	104.00	275.00	0.00*	190.00	78.90	14.10	108.00
91	206.94	43.89	180.14	104.44	170.44	102.53	141.19	64.44	97.48	68.49	162.43	51.19
101	188.00	154.00	77.00	46.00	46.10*	45.10*	340.00*	*	82.50*	77.00*	26.40*	20.00*
111	87.30	78.80	122.00	101.00	70.90	95.50	10.50	127.00	75.90	36.70	85.60	38.70
121	370.00*	*	*	*	*	*	232.00	*	180.00	114.00	*	306.00
131	247.50	128.50	161.50	172.50	172.50	232.50	177.00	265.00	156.00	189.50	72.00	96.50
141	250.00	215.00	139.00	230.00	296.00	146.00	245.00	0.00*	270.00	133.00	257.00	212.00
151	283.00	173.00	149.00	245.00	82.00	843.00*	163.00	0.00*	106.00	378.00*	96.00	840.00*
171	161.00	173.00	218.00	178.00	59.50	174.00	150.00	149.00	184.00	174.00	139.00	80.50
181	*340.00*	535.00*	509.00*	35.70	373.00*	*440.00*	870.00*	250.00	673.00*	334.00*	*560.00*	0.00*
191	159.00	186.00	160.00	172.00	175.00	193.00	112.00	37.00	173.00	145.00	202.00	149.00
201	*	*	276.00	230.00	114.00	*	35.30	109.00	165.00	184.00	276.00	461.00*
211	28.00	26.70	32.63*	10.10*	96.00	87.30	17.40	26.50	116.80	302.80	116.70	64.00
221	295.40	239.60	230.80	197.00	240.00	195.60	550.00	198.20	93.60	191.10	359.40*	187.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - MDN DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-58. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSPEC

RAW DATA FOR PENTACHLOROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER TYPE	
	4	6
HIGH YOUNG PAIR TRUE VALUE UG/L	226.00	202.00
11	274.00	204.00
21	53.40*	65.40*
31	*	*
41	*	*
61	200.00	50.10*
71	165.00	177.00
81	*	*
91	*	*
101	*	*
111	*	*
121	*	*
131	*	*
141	*	*
151	*	*
171	136.00*	132.00*
181	*	*
191	216.00	190.00
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-59.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 374

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
LABORATORY NUMBER	1	2	1	2	1	2	1	2	1	2	1	2
25.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00	25.00	30.00
11	27.90	27.90	*	*	32.60	36.40	18.60	23.30	17.00	8.60	5.10	13.20
21	14.50	16.20	12.00	11.20	1.50	16.00	11.00	12.50	8.95	10.20	0.55	15.90
31	6.52	6.74	11.92	4.68	10.10	12.90	19.40	16.90	40.20*	37.20	12.00	17.80
41	21.30	34.10	16.60	19.40	9.14	30.40	21.00	25.70	19.60	13.70	29.70	12.40
61	4.69	6.58	*	*	18.30	9.31	17.40	9.11	7.60*	12.10*	13.40	15.80
71	4.01	5.86	16.50	15.50	13.90	17.80	18.10	19.70	16.00	14.30	21.20	41.50*
81	6.41	4.19	6.95	2.85	31.10	24.00	9.27	14.40	8.26	15.10	71.30*	0.00*
91	*	*	*	*	0.32*	2.87*	0.34*	1.58*	0.73	0.44	0.44*	1.40*
101	18.20	15.10	25.10	34.10	16.20	8.80	13.90	17.60	0.00*	0.00*	20.60	23.10
111	10.90	19.80	7.41	10.90	1.32	38.50	3.70	6.11	8.90	13.00	7.91	10.20
121	40.10*	23.70	*	*	18.20	40.60	7.32	9.33	7.47	16.00	9.24	18.60
131	14.80	23.60	9.20	16.40	18.20	26.30	39.60	22.70	25.50	16.20	12.30	9.90
141	30.60*	39.00*	19.60	19.30	23.40	26.30	28.80	27.20	23.90	32.60	27.30	19.10
151	10.70	3.20	9.20	4.00	16.00	3.10	1.00	21.00	13.60	9.10	13.00	5.70
171	7.30	1.00	10.70	15.50	18.90	12.40	8.98	13.60	15.40	18.30	17.00	19.40
181	121.00*	102.00*	73.40*	108.00*	142.00*	158.00*	116.00*	118.00*	116.00*	118.00*	124.00*	69.20*
191	20.80	6.33	14.40	21.90	9.50	12.40	14.70	19.50	18.70	23.60	13.70	22.00
201	*	*	19.50*	22.90*	24.10*	72.00*	32.10	44.60*	42.30*	40.20*	23.20*	35.50*
211	12.40	8.60	9.70	10.00	9.90	5.10	9.20	18.50	11.70	18.30	5.90	5.20
221	13.60	19.40	18.70	21.00	13.20	17.40	19.70	24.20	18.20	19.90	18.10	24.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-59. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL:EC

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PATR TRUE VALUE UG/L	WATER	
	1	2
LABORATORY NUMBER	29.00	30.00
11	18.90	13.80
21	3.27*	6.83*
31	*	*
41	*	*
61	7.37	11.80
71	18.20*	26.70*
81	*	*
91	*	*
101	*	*
111	*	*
121	8.65	11.00
131	*	*
141	*	*
151	*	*
171	14.00	23.80
181	17.70	23.40
191	*	*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-60.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSTEC

RAW DATA FOR 2-NITROPHENYL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER												
11	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00	124.00	150.00
21	61.10	110.00	46.00	131.00	74.40	74.40	91.90	105.00	80.00	95.00	87.00	95.50
31	14.20	79.60	1.18	71.90	63.30	63.30	28.50	99.20	68.00	75.80	34.00	67.90
41	52.20	81.00	86.00	103.00	45.90	45.90	20.00	104.00	25.10	107.00	24.60	80.40
51	85.20	165.00	114.00	103.00	29.20	29.20	71.90	63.30	48.30	59.00	16.60	143.00
61	68.40	82.80	60.70	91.90	91.90	91.90	101.00	57.70	44.50	51.50	87.80	23.50
71	164.00	83.70	58.50	535.00	53.70	66.80	51.30	60.40	80.60	216.00	137.00	153.00
81	49.50	72.50	71.60	108.00	105.00	142.00	126.00	165.00	114.00	99.80	9.36	127.00
91	15.91	46.56	6.92	42.70	13.26	42.88	16.24	34.47	26.35	89.44	2.79	1.82
101	88.40	119.00	113.00	100.00	79.40	88.40	120.00	85.70	133.00	122.00	91.30	91.30
111	82.60	626.00	57.10	78.10	71.00	69.50	61.20	85.70	93.60	89.20	68.10	98.30
121	118.00	63.80	82.00	64.50	67.10	103.00	44.30	82.00	102.20	93.00	49.10	54.70
131	120.50	116.00	115.00	79.00	126.00	158.00	103.00	105.50	120.20	93.00	57.00	254.00
141	138.00	182.00	115.00	94.00	116.00	144.00	99.80	115.00	94.20	96.90	145.00	155.00
151	116.00	48.00	94.00	14.00	116.00	43.00	31.00	51.00	139.00	63.00	65.00	29.00
161	85.70	101.00	58.70	45.10	28.90	108.00	60.30	25.00	71.00	100.00	181.00	46.10
171	647.00	692.00	454.00	936.00	352.00	552.00	235.00	365.00	365.00	449.00	614.00	496.00
181	27.20	82.40	55.90	79.10	67.60	67.60	41.00	67.30	83.90	79.00	43.70	67.90
191	57.30	27.00	8.60	249.00	230.00	230.00	110.00	121.00	187.00	241.00	195.00	195.00
201	193.20	144.00	114.80	142.60	163.50	163.50	57.10	65.00	0.30	190.30	37.30	75.80
211					122.80	137.20	117.80	91.80	124.40	313.20	115.00	143.60
221												

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-60. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLSLSEC

94W DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER		
	3	5	7
LABORATORY NUMBER	124.00	150.00	
11	74.50	75.20	
21	39.20*	44.20*	
31	*	*	
41	*	*	
61	39.80	38.80	
71	107.00*	130.00*	
81	*	*	
91	*	*	
101	*	*	
111	*	*	
121	52.60	73.60	
131	*	*	
141	*	*	
151	*	*	
171	72.90	103.00	
181	*	*	
191	82.00	118.00	
201	*	*	
211	*	*	
221	*	*	

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-61.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 378

EPA METHOD VALIDATION STUDY-II ENV PHENOLS:EC

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00	312.00	374.00
11	214.00	279.00	*	*	230.00	243.00	286.00	299.00	261.00	310.00	279.00	302.00
21	160.00	169.00	140.00	218.00	128.00	172.00	200.00	219.00	77.30	130.00	134.00	182.00
31	207.00	223.00	237.00	227.00	210.00	236.00	263.00	253.00	210.00	283.00	200.00	217.00
41	120.00	143.00	95.60	104.00	62.10	106.00	86.10	201.00	129.00	129.00	149.00	104.00
61	225.00	269.00	*	*	221.00	238.00	190.00	281.00	119.00	104.00	331.00	127.00
71	134.00	306.00	97.60	149.00	54.00	172.00	261.00	244.00	137.00	59.70	300.00	252.00
81	64.50	672.00	348.00	299.00	183.00	189.00	220.00	317.00	282.00	208.00	86.30	259.00
91	85.36*	76.86*	55.84*	54.98*	51.44*	73.45*	42.28*	59.37*	131.51	97.53	1.91*	2.54*
101	231.00	241.00	190.00	334.00	213.00	270.00	293.00	*	142.00	231.00	179.00	227.00
111	119.00	139.00	104.00	116.00	104.00	91.50	99.60	112.00	86.60	123.00	126.00	84.40
121	70.30	93.40	*	*	77.30	106.00	44.80	56.60	136.00	162.00	110.00	191.00
131	253.00	314.50	142.00	233.00	211.50	328.00	232.00	26.00	263.50	378.50	94.50	191.50
141	346.00*	334.00*	227.00	336.00	298.00	117.00	342.00	261.00	223.00	244.00	34.00	398.00
151	72.00	100.00	32.00	17.00	74.00	43.00	159.00	4.00	216.00	660.00*	48.00	150.00
171	203.00	277.00	212.00	255.00	28.50	280.00	129.00	94.40	236.00	287.00	110.00	142.00
181	594.00*	613.00*	496.00*	276.00*	589.00*	438.00*	*110.00*	284.00	807.00*	419.00*	*340.00*	6.00*
191	125.00	202.00	156.00	161.00	148.00	161.00	166.00	89.90	134.00	175.00	101.00	147.00
201	*	*	449.00*	527.00*	704.00*	*	166.00	527.00	347.00*	532.00*	738.00*	*070.00*
211	121.20	360.60	940.00*	120.00	146.90	359.80	123.00	166.60	161.90	89.20	142.20	255.00
221	263.00	273.80	273.80	354.20	237.20	359.80	320.00	363.00	313.20	351.20	306.20	335.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-61. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC

RAW DATA FOR 2-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER TYPE	
	4	6
LABORATORY NUMBER	312.00	374.00
11	290.00	362.00
21	58.00*	55.40*
31	*	*
41	*	*
61	93.00	96.10
71	270.00*	407.00*
81	*	*
91	*	*
101	*	*
111	85.60	88.60
121	*	*
131	*	*
141	*	*
151	*	*
171	241.00	251.00
181	*	*
191	325.00	348.00
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-62.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I M V S: PAGE 424

EPA METHOD VALIDATION STUDY-IT ENV PHENOLSPEC

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LABORATORY NUMBER	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	1	2	1	2	1	2	1	2	1	2	1	2
LOW YOUNG PAIR TRUE VALUE UG/L	28.20	32.00	29.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00	28.20	32.00
11	11.70	10.00	9.00	*	15.80*	16.70	31.30	16.60	17.20	17.20	16.70	20.80
21	16.10	15.30	5.94	7.45	7.98	14.80	15.40	16.50	17.81	9.12	4.18	9.38
31	2.72*	2.51*	5.94	0.93	5.10	7.01	12.50	8.66	35.90*	20.20	5.83	7.92
41	12.20	18.30	9.56	11.70	4.70	19.50	0.00*	0.00*	6.00*	2.32*	10.30	1.86
61	5.26	6.82	*	*	9.79	13.30	*	*	13.20	18.80	5.32	6.97
71	1.67	8.94	9.73	7.47	7.18	8.97	27.80	28.30	8.44	7.59	14.80	27.20
81	4.70	2.76	4.95	3.12	7.58	10.30	38.80	27.10	10.50	9.48	5.77*	0.00*
91	4.53	7.69	4.22	5.32	4.67	7.66	2.89	4.19	4.83	5.19	3.52	4.83
101	11.90	8.85	9.78	14.50	9.78	9.78	7.89	12.20	0.00*	0.00*	13.80	13.70
111	299.00*	393.00*	108.00*	154.00*	67.10*	53.30*	24.30	74.20*	120.00*	177.00*	117.00*	54.80*
121	24.20	12.80	*	*	23.80	23.80	32.80	5.16	3.06*	5.76*	3.86	4.14
131	9.70	15.60	1.50	7.10	7.80	19.30	33.00	12.40	16.80	7.00	10.60	6.40
141	16.10	21.10	7.40	6.17	5.61	13.80	12.20	15.80	8.64	30.80	10.60	6.40
151	44.00*	1.80	28.00*	1.80	40.00*	3.60	18.00	21.00	46.00*	5.20	30.00*	1.80
171	2.62	0.58	13.28	4.90	11.80	5.73	3.67	3.00	9.34	9.82	7.20	8.30
181	204.00*	144.00*	404.00*	341.00*	273.00*	367.00*	501.00*	138.00*	342.00*	310.00*	513.00*	213.00*
191	16.90	5.15	11.10	15.10	7.27	4.75	9.80	11.40	13.30	12.30	8.45	14.00
201	8.00	6.90	7.30	11.10	9.20	35.50*	9.20	50.60*	16.80	18.60	16.70	20.50
211	14.40	15.20	5.00	6.20	5.06	13.80	23.10	25.10	7.40	20.40	17.70	13.80
221	14.40	15.20	16.90	23.60*	13.80	11.10	27.00	26.60	16.20	14.30	15.80	13.90

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-62. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD 300 VALIDATION STUDY—IT ENV PHENOL/SEC
 RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

LOW YOUNG PAIR TRUE VALUE UG/L	WATER	
	1	2
LABORATORY NUMBER	20.20	32.00
	11.70	4.19*
11	15.60	11.70
21	3.91*	4.19*
31	*	*
41	*	*
61	6.06	15.60
71	9.29	8.16
81	*	*
91	*	*
101	*	*
111	*	*
121	6.60	5.60
131	*	*
141	*	*
151	*	*
171	8.23	12.10
181	*	*
191	25.30*	32.30*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-63.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

I N V S PAGE 426

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC
RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

MEDIUM YOUDEM PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	3	5	3	5	3	5	3	5	3	5	3	5
LABORATORY NUMBER	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00	210.00	240.00
11	87.70	103.00	*	*	92.10	89.90	118.00	132.00	81.50	107.00	101.00	118.00
21	24.00	76.30	55.60	119.00	26.70	67.00	48.00	110.00	102.00	68.40	34.80	74.80
31	32.50*	48.40*	59.20	28.40	32.60	69.70	16.90	83.00	19.00	76.90	29.60	51.10
41	78.40	116.00	100.00	90.90	58.90	73.40	30.00*	12.20*	31.70*	40.90*	7.00	88.90
61	84.80	48.20	*	*	48.60	53.10	*	*	114.00	131.00	36.60	13.80
71	151.00	131.00	56.90	165.00	53.20	59.40	43.80	52.30	63.30	80.10	166.00	155.00
81	41.60	52.10	78.20	107.00	75.60	127.00	74.40	71.60	67.60	75.00	0.55*	33.20*
91	84.45	63.83	59.52	62.43	61.04	60.45	66.75	59.89	101.41	100.84	75.44	83.23
101	90.90	117.00	100.00	83.50	76.00	80.50	109.00	*	100.00	100.00	64.80	70.00
111	760.00*	223.00*	287.00*	696.00*	28.00	346.00*	323.00*	560.00*	569.00*	907.00*	226.00*	436.00*
121	62.20	36.10	*	*	37.70	54.30	125.00	95.70	45.40*	53.90*	31.00	29.50
131	167.00	92.00	46.50	89.50	67.00	97.50	186.00	77.50	104.60	70.50	40.00	322.50*
141	110.00	147.00	49.50	20.50	123.00	139.00	120.00	83.80	92.20	65.60	128.00	128.00
151	540.00*	140.00	290.00*	21.00	245.00*	77.00	472.00*	105.00	645.00*	490.00*	192.00	65.00
171	86.70	113.00	56.70	40.70	25.10	94.03	95.80	25.40	66.30	93.70	115.00	33.70
181	640.00*	320.00*	855.00*	660.00*	557.00*	907.00*	344.00*	105.00*	659.00*	753.00*	280.00*	280.00*
191	44.50	130.00	76.60	114.00	*	44.90	30.40	73.50	82.10	96.90	37.10	49.70
201	102.30	3.90	*	*	*	194.00*	73.20	99.50	162.00	203.00*	*	212.00
211	95.80	238.60	97.60	109.80	94.40	79.70	90.00	79.50	130.40	130.40	50.20	78.30
221						110.60	111.20	90.80	102.00	106.80	86.40	108.00

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
- 2 - TAP WATER - NON DC
- 3 - SURFACE WATER
- 4 - WASTE WATER 1
- 5 - WASTE WATER 2
- 6 - WASTE WATER 3

TABLE A-63. (CONTINUED)
 ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
 OFFICE OF RESEARCH AND DEVELOPMENT
 ENVIRONMENTAL PROTECTION AGENCY
 EPA METHOD VALIDATION STUDY-TT ENV PHENOLSiEC
 RAW DATA FOR 4-NITROPHENJL ANALYSIS BY WATER TYPE

MEDIUM YOUNG PAIR TRUE VALUE UG/L	WATER 7	
	3	5
	210.00	240.00
LABORATORY NUMBER		
11	92.10	84.40
21	33.90*	40.60*
31	*	*
41	*	*
61	57.20	43.80
71	97.30	70.40
81	*	*
91	*	*
101	*	*
111	*	*
121	36.50	33.50
131	*	*
141	*	*
151	*	*
171	85.30	96.10
181	*	*
191	99.40*	264.00*
201	*	*
211	*	*
221	*	*

* = REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-64.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOL/SEC

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER 1		WATER 2		WATER 3		WATER 4		WATER 5		WATER 6	
	4	6	4	6	4	6	4	6	4	6	4	6
LABORATORY NUMBER												
11	131.00	160.00	*	*	134.00	149.00	174.00	180.00	154.00	156.00	148.00	151.00
21	100.00	107.00	98.30	134.00	83.40	115.00	137.00	138.00	95.60	134.00	38.90	123.00
31	65.80*	75.20*	94.90	48.20	125.00	97.60	142.00	103.00	101.00	117.00	75.60	106.00
41	40.50	49.50	52.70	39.70	36.50	32.30	5.90*	7.60*	41.10*	32.50*	50.00	30.00
61	86.00	111.00	*	*	91.80	91.30	96.40	89.50	163.00	150.00	147.00	28.80
71	168.00	187.00	70.40	85.90	19.40	64.30	96.40	89.50	57.10	71.70	171.00	164.00
81	48.60	419.00*	178.00	86.50	114.00	89.70	75.00	126.00	117.00	80.00	26.80*	39.30*
91	183.62	59.33	144.71	69.71	125.84	55.63	87.29	50.15	220.35	87.74	146.61	42.37
101	119.00	122.00	42.50	122.00	123.00	134.00	134.00	50.15	60.50	99.50	72.50	111.00
111	310.00*	240.00*	510.00*	610.00*	190.00*	560.00*	102.00	320.00*	838.00*	20.00*	340.00*	210.00*
121	26.20	49.60	*	*	48.30	44.30	96.20	217.00	63.80*	54.70*	137.00	191.00
131	122.50	140.00	47.10	34.00	82.50	105.00	106.00	378.00*	130.00	158.50	31.20	23.40
141	176.00	236.00	92.80	136.00	172.00	83.60	161.00	116.00	121.00	106.00	208.00	193.00
151	220.00	326.00	18.00	26.00	35.00	175.00	35.00	3.50	455.00*	298.00*	52.00	298.00
171	98.70	137.00	199.00	220.00	20.00	127.00	86.30	47.80	111.00	109.00	53.80	44.50
181	485.00*	497.00*	730.00*	136.00*	300.00*	100.00*	810.00*	293.00*	518.00*	294.00*	260.00*	0.00*
191	73.20	165.00	133.00	126.00	87.20	103.00	109.00	39.30	88.20	114.00	31.50	85.20
201	*	*	222.00*	175.00	297.00*	103.00*	99.10	231.00	169.00	241.00*	617.00*	560.00*
211	*	*	90.00	90.00	76.10	129.00	76.10	129.00	126.30	108.60	153.30	144.00
221	124.60	146.60	109.00	149.20	101.00	146.40	148.10	159.40	148.00	151.00	89.60	123.20

* = REJECTED

WATER LEGEND

- 1 - DISTILLED WATER
2 - TAP WATER - NON DC
3 - SURFACE WATER
4 - WASTE WATER 1
5 - WASTE WATER 2
6 - WASTE WATER 3

TABLE A-64. (CONTINUED)

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT EMV PHENOLSTEC

RAW DATA FOR 4-NITROPHENOL ANALYSIS BY WATER TYPE

HIGH YOUNG PAIR TRUE VALUE UG/L	WATER	
	7	8
LABORATORY NUMBER	290.60	320.00
11	156.00	172.00
21	28.50*	35.70*
31	*	*
41	*	*
61	75.00	74.50
71	80.00	123.00
81	*	*
91	*	*
101	*	*
111	*	*
121	56.40	43.80
131	*	*
141	*	*
151	*	*
171	130.00	134.00
181	*	*
191	369.00*	369.00*
201	*	*
211	*	*
221	*	*

* - REJECTED

WATER LEGEND

7 - TAP WATER - DC

TABLE A-65.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON PHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.01076

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.2406	-.0727
3	-.0124	-.0000
4	-.1161	-.0276
5	-.3553	-.0703
6	-.0775	-.0231
7	-.2836	-.0442

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	598.00088	598.00088		
REG(WATER/DISTILLED)	12	19.94328	1.66194	10.24	.0000
ERROR	542	87.95639	.16228		
TOTAL	555	705.90255			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.2406	(-1.0138, .5326)	-.0727	(-.2456, .1003)
3	-.0124	(-.7194, .7442)	-.0000	(-.1644, .1644)
4	-.1161	(-.5946, .3629)	-.0276	(-.1873, .1321)
5	-.3553	(-1.3533, .6333)	-.0703	(-.2281, .0884)
6	-.0775	(-.6467, .4917)	-.0231	(-.1659, .1198)
7	-.2836	(-1.2360, .6688)	-.0442	(-.1672, .2556)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-66.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2,4-DIMETHYLPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.08913

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.8093	-.0625
3	-.1279	-.0044
4	-.7022	.1029
5	-.2340	-.0434
6	-.1026	-.0969
7	-.3614	.0779

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	614.43419	614.43419		
REG(WATER/DISTILLED)	12	49.57178	4.13098	9.22	.0000
ERROR	507	254.14906	.4823		
TOTAL	580	918.15502			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.8093	(-.20361 , .4196)	-.0625	(-.3788 , .2538)
3	-.1279	(-.2447 , .9889)	-.0044	(-.2905 , .2876)
4	-.7022	(-.8232 , .4189)	.1029	(-.1906 , .3963)
5	-.2340	(-.3553 , .8854)	-.0434	(-.3353 , .2486)
6	-.1026	(-.2094 , 1.0042)	-.0969	(-.3866 , .1927)
7	-.3614	(-.18625 , 1.1598)	.0779	(-.3201 , .4759)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-67.

```

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2-CHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.03428
WATER INTERCEPT(WATER-DISTILLED) SLOPE(WATER-DISTILLED)

2 1274 - .0640
3 1942 - .0427
4 1593 - .0427
5 1736 - .0804
6 1221 - .0434
7 - .0508

```

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	683.78084	683.78084		
REG(WATER/DISTILLED)	12	2.11329	.17611		
ERROR	583	73.95957	.12686	1.39	.1667
TOTAL	596	759.85370			

WATER	INTERCEPT (WATER-DISTILLED)		SLOPE (WATER-DISTILLED)	
	ESTIMATE	INTERVAL	ESTIMATE	INTERVAL
2	1274	(-4227 , 6775)	-0040	(-1431 , 1350)
3	1922	(-3445 , 7288)	-0427	(-1796 , 0942)
4	1593	(-3675 , 6861)	-0293	(-1040 , 1053)
5	1736	(-3587 , 7059)	-0604	(-1955 , 0748)
6	1221	(-4117 , 6559)	-0434	(-1796 , 0929)
7	0508	(-7938 , 6931)	-0095	(-1793 , 1983)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-68.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:FID

EFFECT OF WATER TYPE ON 4-CHLORO-3-METHYLPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.02372

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.8185	.0364
3	-.1038	.0090
4	.0344	-.0445
5	-.1958	.0130
6	-.4258	.0520
7	-.3940	.0529

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	683.03134	683.03134		
REG(WATER/DISTILLED)	12	20.27768	1.68981	7.89	.0000
ERROR	550	117.76652	.21412		
TOTAL	563	821.07554			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.8185	(-1.7877 , .1506)	.0364	(-.1574 , .2301)
3	-.1038	(-1.0144 , .8069)	.0090	(-.1739 , .1919)
4	.0344	(-.8585 , .9274)	-.0445	(-.2235 , .1345)
5	-.1958	(-1.1084 , .7148)	.0130	(-.1686 , .1946)
6	-.4258	(-1.3266 , .4751)	.0520	(-.1287 , .2327)
7	-.3940	(-1.7032 , .9152)	.0529	(-.2092 , .3150)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE COMPARISON WATER TYPE FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-69.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2,4-DICHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = .99257			
WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)	
2	-.0825		
3	.0103	.0045	
4	.0927	-.0024	
5	-.2587	-.0410	
6	-.1405	.0291	
7	-.1062	-.0520	
		.0039	

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	724.99029	724.99029		
REG(WATER/DISTILLED)	12	1.96950	.16412	1.23	.2587
ERROR	598	79.84806	.13353		
TOTAL	611	806.80784			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.0825	(-.7134 , .5483)	.0045	(-.1377 , .1468)
3	.0103	(-.5787 , .5983)	-.0024	(-.1359 , .1311)
4	.0927	(-.4906 , .6760)	-.0410	(-.1732 , .0911)
5	-.2587	(-.8421 , .3246)	.0291	(-.1026 , .1608)
6	-.1405	(-.4566 , .7376)	-.0520	(-.1870 , .0830)
7	-.1062	(-.5461 , .7337)	.0039	(-.1845 , .1922)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-70.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2,4,6-TRICHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.02498

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.3167	-.0507
3	.1902	-.0332
4	.5426	-.1127
5	.6735	-.1369
6	.1547	-.0356
7	.3331	-.0472

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	503.82739	503.82739		
REG(WATER/DISTILLED)	12	2.38853	.19904	2.04	.0189
ERROR	571	55.59130	.09736		
TOTAL	584	561.80722			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.3167 (-.2837 , .9171)		-.0507 (-.1912 , .0898)	
3	.1902 (-.3996 , .7801)		-.0332 (-.1712 , .1048)	
4	.5426 (-.0294 , 1.1174)		-.1127 (-.2465 , .0211)	
5	.6735 (-.0114 , 1.2456)		-.1369 (-.2704 , .0034)	
6	.1547 (-.4216 , .7310)		-.0356 (-.1705 , .0993)	
7	.3331 (-.4512 , 1.1174)		-.0472 (-.1730 , .0786)	

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-71.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON PENTACHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = .94127			
WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)	
2	-.2052	.0427	
3	.1577	-.0407	
4	1.5693	-.3002	
5	.4366	-.1042	
6	-.3499	.0537	
7	-.0574	.0200	

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	545.63587	545.63587		
REG(WATER/DISTILLED)	12	14.95564	1.24630	5.34	.0000
ERROR	577	134.66587	.23339		
TOTAL	590	695.25738			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.2052	(-1.0359, .6255)	.0427	(-.1411, .2264)
3	.1577	(-.6606, .9801)	-.0407	(-.2222, .1409)
4	1.5693	(.7193, 2.4193)	-.3002	(-.4857, -.1147)
5	.4366	(-.3823, 1.2555)	-.1042	(-.2841, .0758)
6	-.3499	(-1.1627, .4629)	.0537	(-.1252, .2326)
7	-.0574	(-1.2304, 1.1157)	.0200	(-.2402, .2803)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-72.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2-NITROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.04107

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.3048	-.0581
3	.3310	-.0582
4	.1589	-.0300
5	.2557	-.0500
6	.3074	-.0604
7	.0118	-.0087

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	.680.02648	.680.02648		
REG(WATER/DISTILLED)	12	.65057	.05421	.77	.6862
ERROR	586	41.48804	.07080		
TOTAL	599	722.10508			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.3048	(-.2085 , .8180)	-.0581	(-.1645 , .0483)
3	.3310	(-.1506 , .8128)	-.0582	(-.1584 , .0420)
4	.1589	(-.3375 , .6552)	-.0300	(-.1335 , .0736)
5	.2557	(-.2294 , .7408)	-.0500	(-.1506 , .0507)
6	.3074	(-.1716 , .7863)	-.0604	(-.1801 , .0393)
7	.0118	(-.6198 , .6434)	-.0087	(-.1399 , .1226)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-73.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 4-NITROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.06303

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.7897	-.1564
3	.7985	-.1582
4	.4264	-.0832
5	.5507	-.1286
6	.4137	-.0911
7	.7750	-.1531

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	588.24477	588.24477		
REG(WATER/DISTILLED)	12	2.60468	.21706	1.05	.3998
ERROR	581	119.93778	.20643		
TOTAL	594	690.78723			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.7897 (	-.1862	-.1564 (	-.3499
3	.7985 (	-.1157	-.1582 (	-.3436
4	.4264 (	-.4921	-.0832 (	-.2694
5	.5507 (	-.3956	-.1286 (	-.3193
6	.4137 (	-.5124	-.0911 (	-.2786
7	.7750 (	-.4106	-.1531 (	-.3941

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-74.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:FID

EFFECT OF WATER TYPE ON 4,6-DINITRO-2-METHYLPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: $\text{GAMMA}(1) = 1.06316$

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.3454	-.0619
3	.4360	-.0789
4	.1593	-.0257
5	.6145	-.1078
6	.3889	-.0658
7	.2926	-.0671

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	572.44358	572.44358		
REG(WATER/DISTILLED)	12	1.36829	.11386	1.20	.2821
ERROR	590	56.17509	.09521		
TOTAL	603	629.98496			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.3454	(-.3012, .9920)	-.0619	(-.1949, .0710)
3	.4360	(-.1951, 1.0671)	-.0789	(-.2082, .0503)
4	.1593	(-.4827, .8013)	-.0257	(-.1571, .1058)
5	.6145	(-.0274, 1.2563)	-.1078	(-.2391, .0234)
6	.3889	(-.2558, 1.0336)	-.0658	(-.1975, .0659)
7	.2926	(-.6211, 1.2064)	-.0671	(-.2532, .1190)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-75.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:FID
EFFECT OF WATER TYPE ON 2,4-DINITROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.16992

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	1.0610	- .1946
3	1.1501	- .1946
4	1.0410	- .1701
5	1.0871	- .1647
6	1.3013	- .2166
7	.7587	- .1524

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	496.19597	496.19597		
REG(WATER/DISTILLED)	12	9.14454	.76204	2.94	.0006
ERROR	589	152.83561	.25948		
TOTAL	602	658.17611			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	1.0610 (	-.0201 , 2.1420)	-.1946 (	-.4179 , .0287)
3	1.1501 (	-.1268 , 2.1734)	-.1946 (	-.4063 , .0171)
4	1.0410 (	-.0296 , 2.1117)	-.1701 (	-.3695 , .0493)
5	1.0871 (	-.0037 , 2.1705)	-.1647 (	-.3870 , .0575)
6	1.3013 (	-.2504 , 2.3522)	-.2166 (	-.4333 , .0000)
7	.7587 (	-.7265 , 2.2439)	-.1524 (	-.4576 , .1529)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN
DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION
AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-76.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC
EFFECT OF WATER TYPE ON PHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = .99314

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-1.0058	.1062
3	-.2168	.0400
4	-.7222	.0921
5	-.0960	-.0205
6	-.3405	.0324
7	-.0954	-.0893

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	615.08266	615.08266		
REG(WATER/DISTILLED)	12	18.66157	1.55513	2.91	.0006
ERROR	545	291.30874	.53451		
TOTAL	558	925.05296			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-1.0058	(-2.6034, .5919)	.1062	(-.2396, .4520)
3	-.2168	(-1.5858, 1.1522)	.0400	(-.2618, .3417)
4	-.7222	(-2.0644, .6201)	.0921	(-.2043, .3886)
5	-.0960	(-1.2232, 1.4151)	-.0205	(-.3113, .2703)
6	-.3405	(-1.7083, 1.0273)	.0324	(-.2683, .3331)
7	-.0954	(-1.6819, 1.8727)	-.0893	(-.4755, .3150)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-77.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY
EPA METHOD VALIDATION STUDY-II ENV PHENOLS:EC
EFFECT OF WATER TYPE ON 2,4-DIMETHYLPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.03896

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.6571	-.0419
3	-.8328	.1520
4	-.4361	.0204
5	-.0897	-.0577
6	.7541	-.2811
7	.6094	-.1896

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	405.01968	405.01968		
REG(WATER/DISTILLED)	12	32.05653	2.72138	4.31	.0000
ERROR	512	323.41600	.63167		
TOTAL	525	821.09221			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.6571	(-2.2032 , .8899)	-.0419	(-.4365 , .3527)
3	-.8328	(-2.2001 , .5344)	.1520	(-.2040 , .5081)
4	-.4361	(-1.7700 , .8978)	.0204	(-.3256 , .3665)
5	-.0897	(-1.4242 , 1.2447)	-.0577	(-.4038 , .2884)
6	.7541	(-.6265 , 2.1347)	-.2811	(-.6414 , .0791)
7	.6094	(-1.1773 , 2.3962)	-.1896	(-.6556 , .2763)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-78.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC
EFFECT OF WATER TYPE ON 2-CHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = .95917			
WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)	
2	-.1224	.0520	
3	-.2472	.0550	
4	-.3144	.0403	
5	-.1540	.0670	
6	-.2652	-.0472	
7	-.1228	-.0091	

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	635.21583	635.21583		
REG(WATER/DISTILLED)	12	6.67162	.55597	1.02	.4280
ERROR	558	303.99835	.54480		
TOTAL	571	945.88580			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.1224	(-.13306 , 1.0857)	.0520	(-.2541 , .3582)
3	-.2472	(-.14200 , .9257)	.0550	(-.2442 , .3542)
4	-.3144	(-.14692 , .8404)	.0403	(-.2538 , .3345)
5	-.1540	(-.13246 , 1.0160)	.0670	(-.2299 , .3640)
6	-.2652	(-.9326 , 1.4631)	-.0472	(-.3519 , .2575)
7	-.1228	(-.17714 , 1.5258)	-.0091	(-.4283 , .4102)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-79.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-11 ENV PHENOLS:EC

EFFECT OF WATER TYPE ON 4-CHLORO-3-METHYLPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.04392

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.7705	-.0549
3	-.1949	-.0472
4	-.3409	-.0211
5	-.1386	-.0066
6	-.0246	-.0079
7	-.7122	-.0635

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	717.45502	717.45502		
REG(WATER/DISTILLED)	12	17.64412	1.47034	3.43	.0001
ERROR	574	245.86598	.42834		
TOTAL	587	930.96571			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.7705	(-2.0786, .5377)	-.0549	(-.2060, .1568)
3	-.1949	(-1.0786, 1.4685)	-.0472	(-.3021, .2078)
4	-.3409	(-1.5770, .8952)	-.0211	(-.2266, .2688)
5	-.1386	(-1.3979, 1.1207)	-.0066	(-.2445, .2618)
6	-.0246	(-1.2200, 1.2693)	-.0079	(-.3183, .1825)
7	-.7122	(-2.6041, 1.1796)	-.0635	(-.3129, .4400)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-80.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

FPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EG
EFFECT OF WATER TYPE ON 2,4-DICHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.11423

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.0988	.0271
3	.2500	-.0565
4	.4348	-.0914
5	.4274	-.0810
6	-.0136	-.0141
7	.1523	-.0347

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	803.55449	803.55449		
REG(WATER/DISTILLED)	12	2.38954	.19904	.67	.7800
ERROR	550	163.17507	.29668		
TOTAL	563	969.11810			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.0988	(-1.0398 , .8422)	.0271	(-.1859 , .2402)
3	.2500	(-.6807 , 1.1808)	-.0565	(-.2672 , .1541)
4	.4348	(-.4895 , 1.3592)	-.0914	(-.3002 , .1173)
5	.4274	(-.5171 , 1.3718)	-.0810	(-.2935 , .1315)
6	-.0136	(-.9564 , .9293)	-.0141	(-.2276 , .1993)
7	.1523	(-.1647 , 1.4693)	-.0347	(-.3280 , .2585)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-81.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-II ENV PHENOLS:EC
EFFECT OF WATER TYPE ON 2,4,6-TRICHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.11295

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.4609	-.0862
3	.3291	-.0841
4	.4358	-.0968
5	.3973	-.0910
6	.5295	-.1122
7	.6107	-.1225

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	577.60535	577.60535		
REG(WATER/DISTILLED)	12	1.70821	.14235	52	.9006
ERROR	577	157.10722	.27228		
TOTAL	590	736.42078			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.4609	(-.5616 , 1.4834)	-.0862	(-.3240 , .1516)
3	.3291	(-.6361 , 1.2942)	-.0841	(-.3191 , .1418)
4	.4358	(-.5169 , 1.3884)	-.0968	(-.3187 , .1258)
5	.3973	(-.5794 , 1.3740)	-.0910	(-.3366 , .1355)
6	.5295	(-.4333 , 1.4923)	-.1122	(-.3379 , .1135)
7	.6107	(-.7469 , 1.9683)	-.1225	(-.4437 , .1986)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER (INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-82.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY--IT ENV PHENOLS:EC
EFFECT OF WATER TYPE ON PENTACHLOROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.06085

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	-.0142	-.0094
3	-.3170	-.0162
4	2.3324	-.4501
5	-.2900	-.0787
6	-.2954	-.1156
7	-.3917	-.0574

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	606.42332	606.42332		
REG(WATER/DISTILLED)	12	36.50149	3.04179	8.69	.0000
ERROR	556	194.60759	.35001		
TOTAL	569	837.53240			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	-.0142	(-1.0878, 1.0595)	-.0094	(-.2454, .2265)
3	-.3170	(-1.3611, .7270)	-.0162	(-.2130, .2453)
4	2.3324	(1.2721, 3.3926)	-.4501	(-.6821, -.2180)
5	-.2900	(-.7528, 1.3327)	-.0787	(-.3066, .1492)
6	-.2954	(-.7562, 1.3270)	-.1156	(-.3425, .1112)
7	-.3917	(-1.1048, 1.8661)	-.0574	(-.3944, .2795)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-83.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-IT ENV PHENOLS:EC
EFFECT OF WATER TYPE ON 2-NITROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.1186
WATER INTERCEPT(WATER-DISTILLED) SLOPE(WATER-DISTILLED)

2	.4227	-.0981
3	.6852	-.1527
4	.6947	-.1453
5	.4926	-.0829
6	.2964	-.0665
7	.5003	-.0928

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REGIDISTILLED)	1	683.55540	683.55540		
REGIWATER/DISTILLED)	12	2.94060	.24555	.66	.7872
ERROR	570	211.01592	.37020		
TOTAL	583	897.51792			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.4227	(-.7761 , 1.6216)	-.0981	(-.3484 , .1523)
3	.6852	(-.4690 , 1.8394)	-.1527	(-.3930 , .0876)
4	.6947	(-.4305 , 1.8259)	-.1453	(-.3814 , .0909)
5	.4926	(-.6646 , 1.6497)	-.0829	(-.3236 , .1579)
6	.2964	(-.8638 , 1.4566)	-.0665	(-.3075 , .1745)
7	.5003	(-.1713 , 2.1718)	-.0928	(-.4401 , .2545)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE).
THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

TABLE A-84.

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

EPA METHOD VALIDATION STUDY-11 ENV PHENOLS:EC
EFFECT OF WATER TYPE ON 4-NITROPHENOL ANALYSIS

** POINT ESTIMATES **

DISTILLED WATER SLOPE: GAMMA(1) = 1.14581

WATER	INTERCEPT(WATER-DISTILLED)	SLOPE(WATER-DISTILLED)
2	.1841	.0010
3	.6505	.1544
4	1.6796	.3286
5	.7768	.1375
6	.4907	.1248
7	.6836	.1526

** ANALYSIS OF VARIANCE **

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB
REG(DISTILLED)	1	618.05402	618.05402		
REG(WATER/DISTILLED)	12	13.28805	1.10734	3.52	.0000
ERROR	541	170.38358	.31494		
TOTAL	554	801.72565			

** TABLE OF 95% CONFIDENCE INTERVALS FOR THE DIFFERENCES BETWEEN INTERCEPTS AND THE DIFFERENCES BETWEEN SLOPES **

WATER	INTERCEPT(WATER-DISTILLED) ESTIMATE	INTERVAL	SLOPE(WATER-DISTILLED) ESTIMATE	INTERVAL
2	.1841	(-.13403, .9782)	.0010	(-.2342, .2362)
3	.6505	(-.4812, 1.7823)	.1544	(-.3829, .741)
4	1.6796	(.5534, 2.8058)	.3286	(-.5571, .1001)
5	.7768	(-.3875, 1.9411)	.1375	(-.3730, .6979)
6	.4907	(-.6523, 1.6137)	.1248	(-.3537, .6041)
7	.6836	(-.9380, 2.3052)	.1526	(-.4800, .1747)

NOTE: IF ZERO IS CONTAINED WITHIN A GIVEN CONFIDENCE INTERVAL THEN THERE IS NO STATISTICAL SIGNIFICANCE BETWEEN DISTILLED WATER AND THE CORRESPONDING WASTE WATER FOR THE ASSOCIATED PARAMETER(INTERCEPT/SLOPE). THE SLOPE AND INTERCEPT ESTIMATES FROM THIS ANALYSIS ARE NOT THE SAME AS THOSE OBTAINED FROM THE PRECISION AND ACCURACY REGRESSIONS PERFORMED EARLIER.

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

CLEAN WATER
UNSPIKED

FID ATTN. 16X

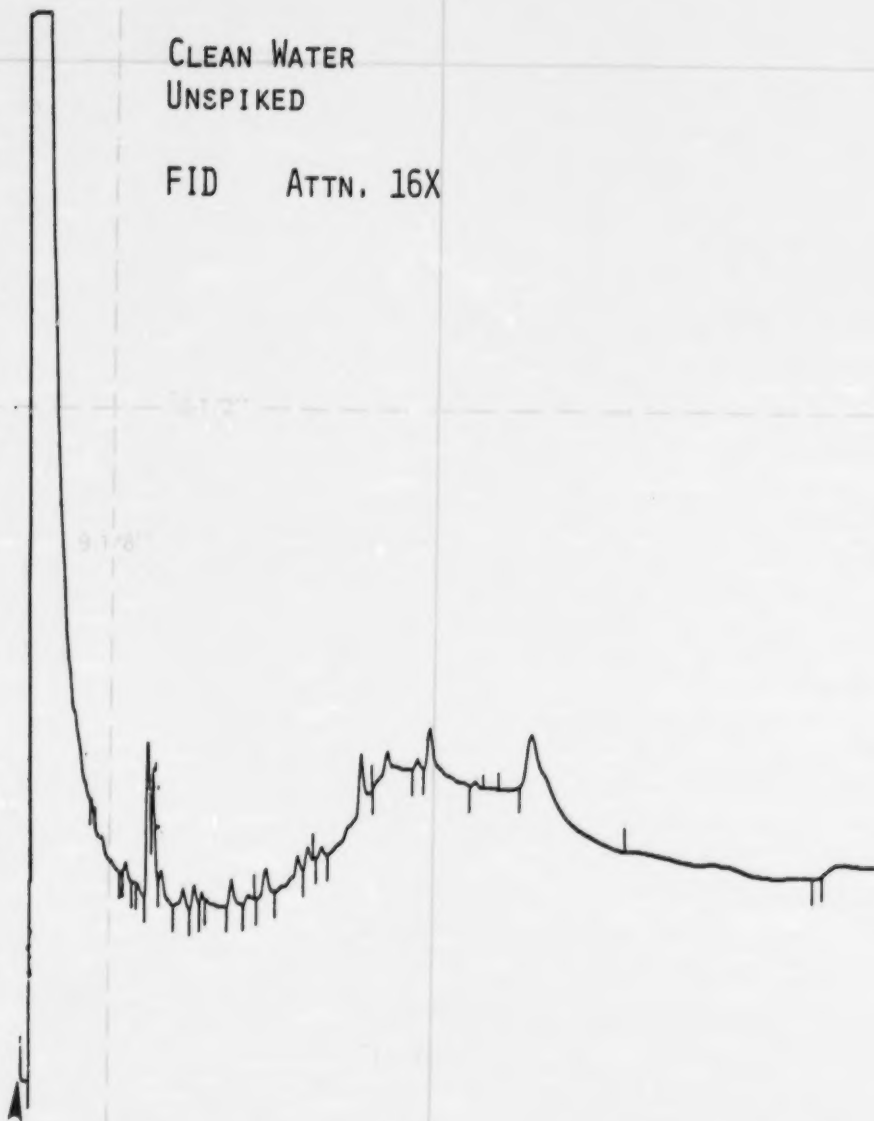


Figure A-1

BEGIN
LAST LINE
OF TEXT

3/8"

225

PAGE NUMBER

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

EPA Form 2250-4 (4-80)
(PREVIOUSLY CEN-EPA FORM 587)

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

CLEAN WATER
SPIKED WITH AMPULE 5

FID ATTN. 64X

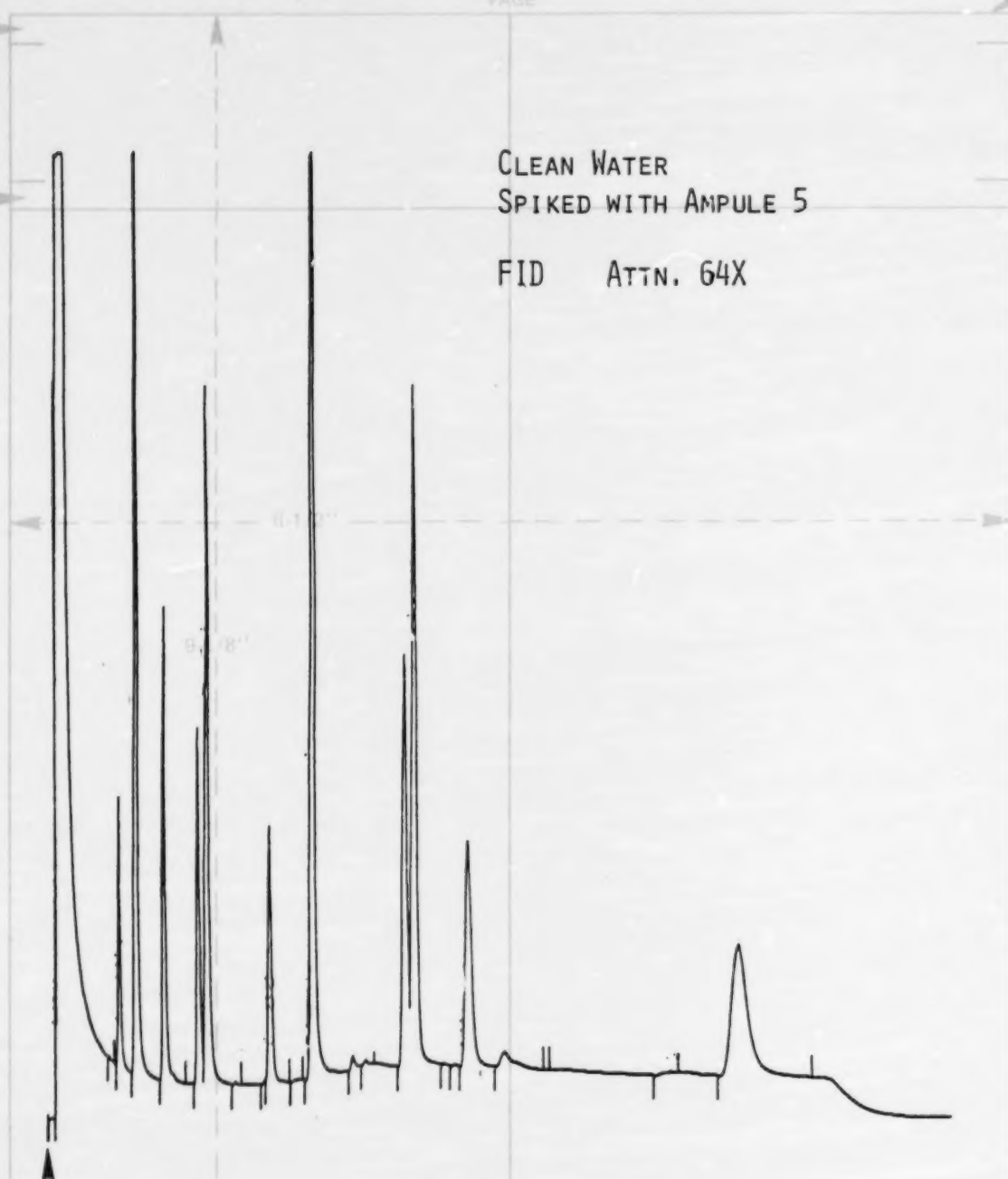


Figure A-2

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

226

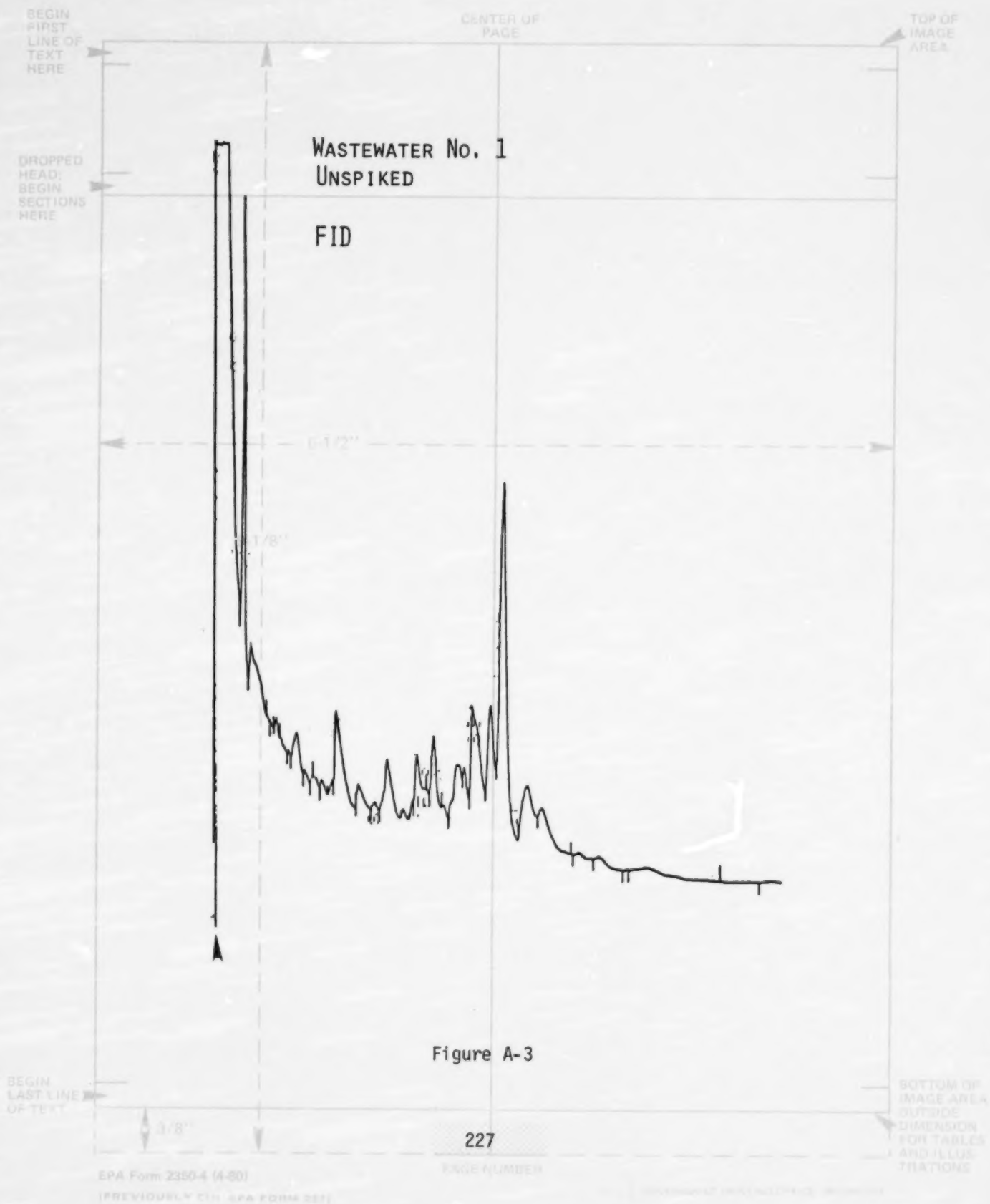


Figure A-3

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 1
SPIKED WITH AMPULE 5

FID

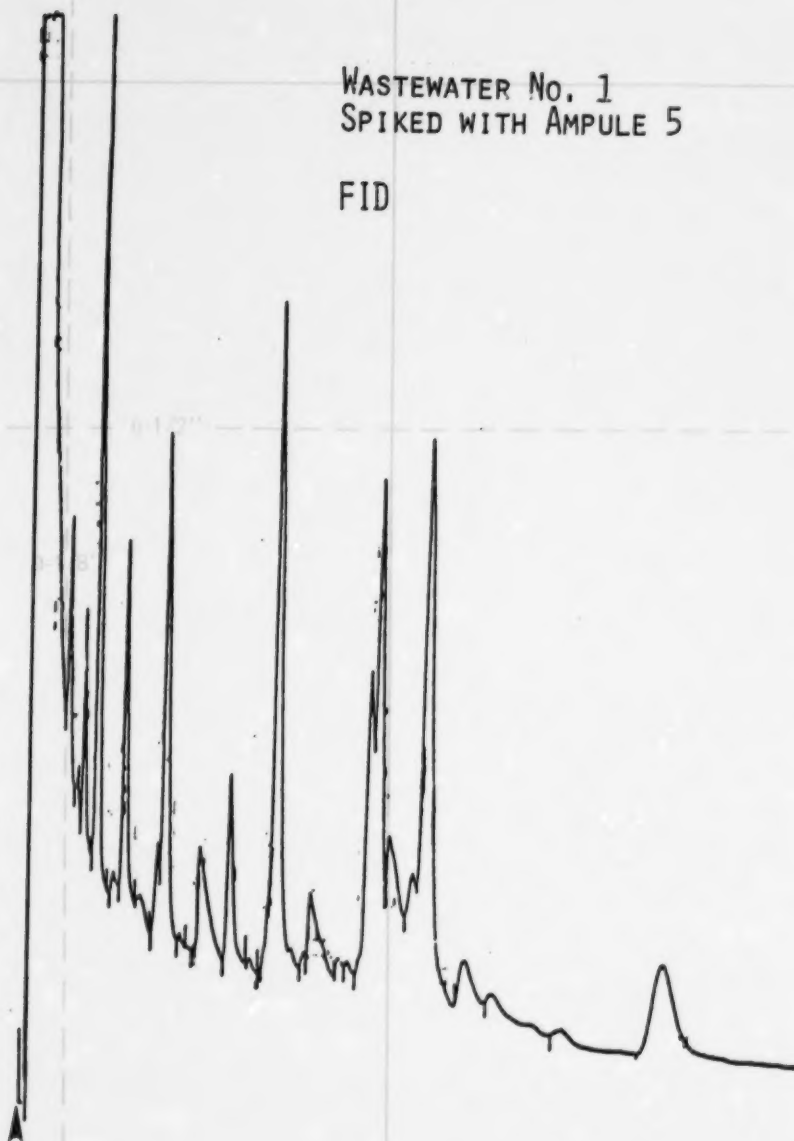


Figure A-4

BEGIN
LAST LINE
OF TEXT

3/8"

228

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

EPA Form 2250-4 (4-80)

(PREVIOUSLY CALLED EPA FORM 245)

PAGE NUMBER

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
UNSPIKED

FID ATTN. 16X

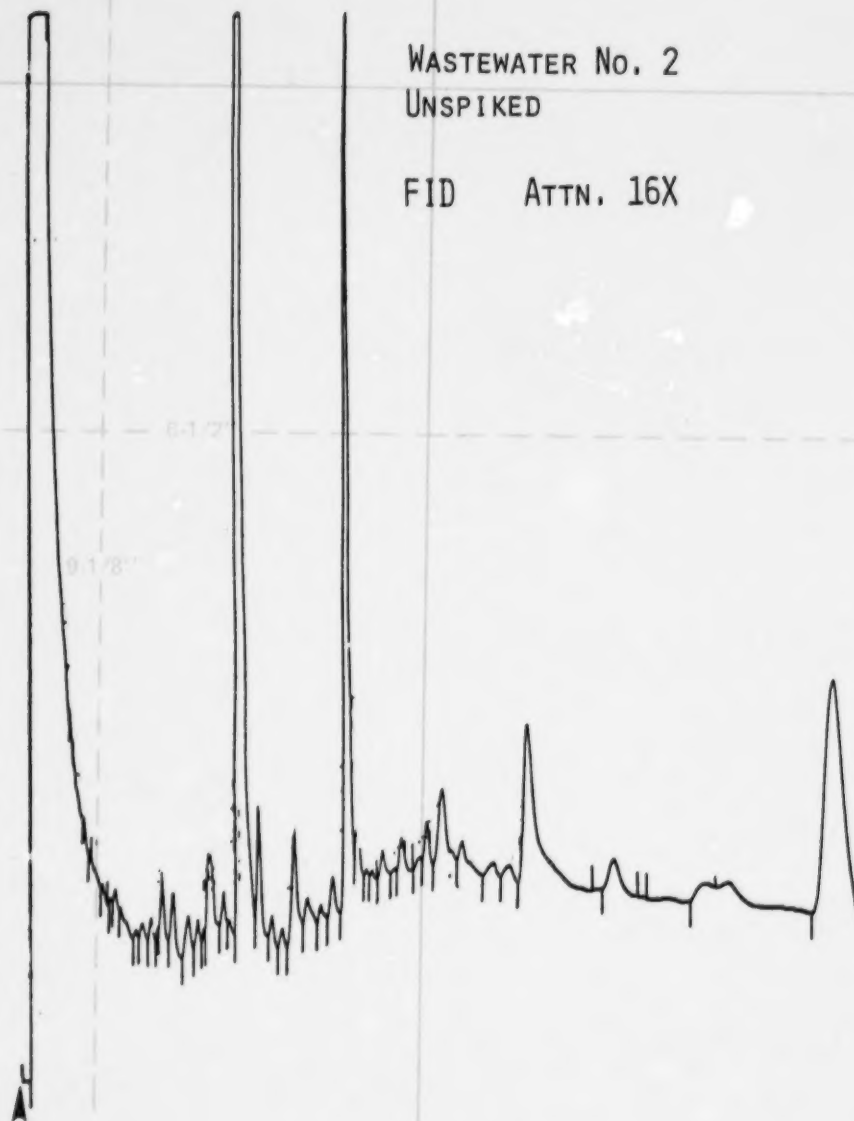


Figure A-5

BEGIN
LAST LINE
OF TEXT

229

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
SPIKED WITH AMPULE 3

FID ATTN. 64X

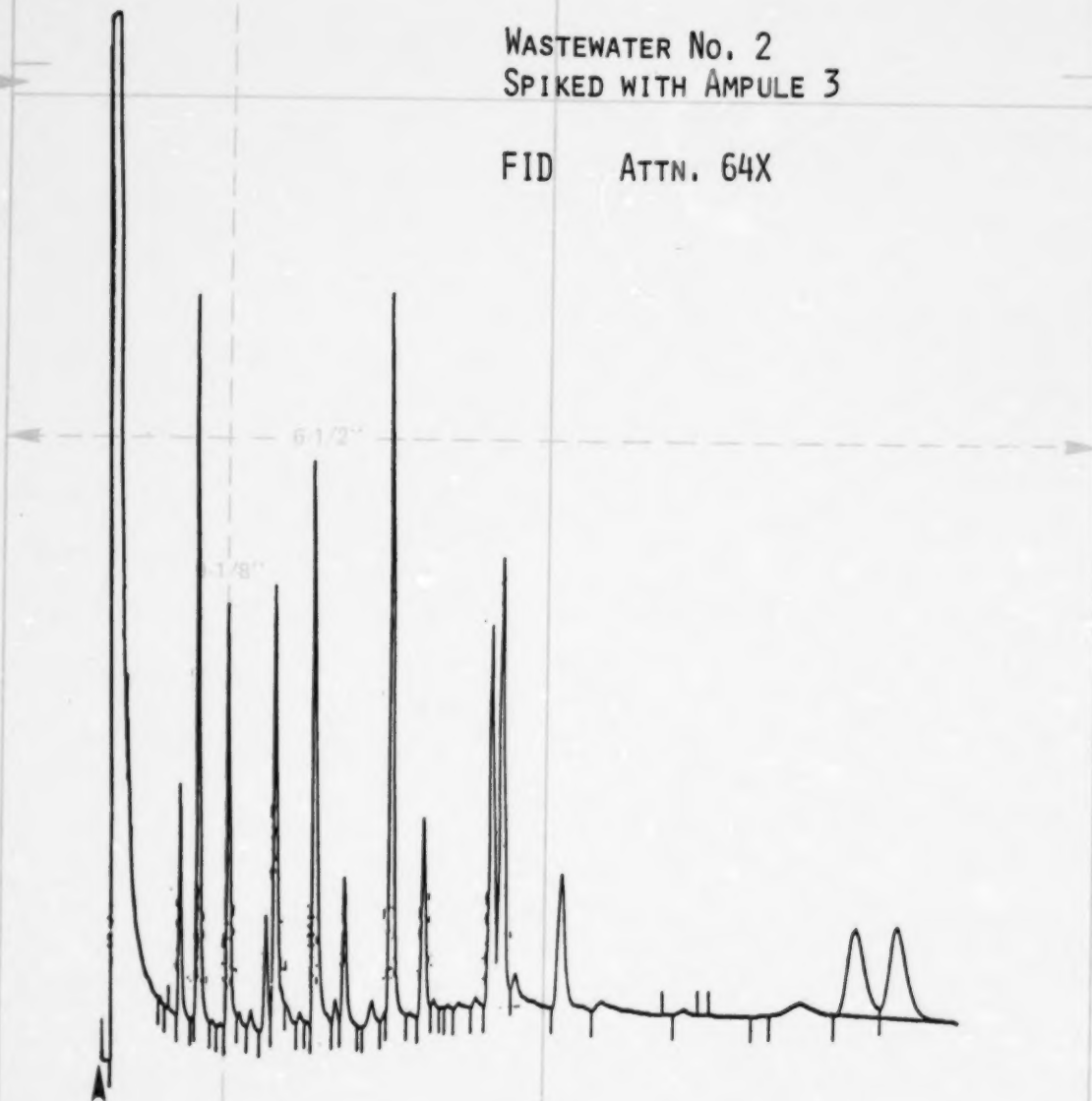


Figure A-6

BEGIN
LAST LINE
OF TEXT

3/8"

230

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
UNSPIKED

FID

5-1/2"

1-3/8"

BEGIN
LAST LINE
OF TEXT

3/8"

Figure A-7

231

EPA Form 2350-4 (4-20)

(PREVIOUSLY CEN. EPA FORM 287)

PAGE NUMBER

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
SPIKED WITH AMPULE 5

FID

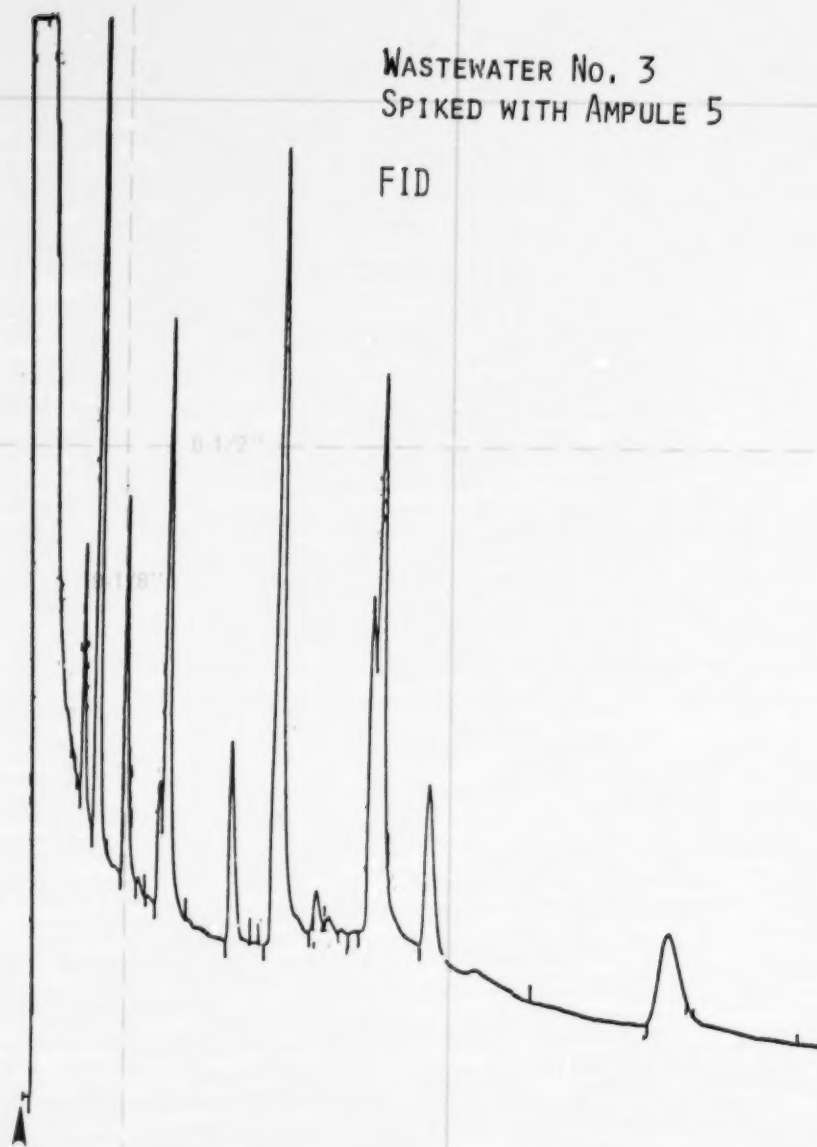


Figure A-8

BEGIN
LAST LINE
OF TEXT

3/8"

232

BOTTOM OF
IMAGE AREA:
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

CLEAN WATER
UNSPIKED
COMBINED FRACTIONS 2 AND 3
PFBB DERIVATIVES

EC ATTN. 128

Figure A-9

233

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

CLEAN WATER
SPIKED WITH AMPULE 5
COMBINED FRACTIONS 2 AND 3
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 123

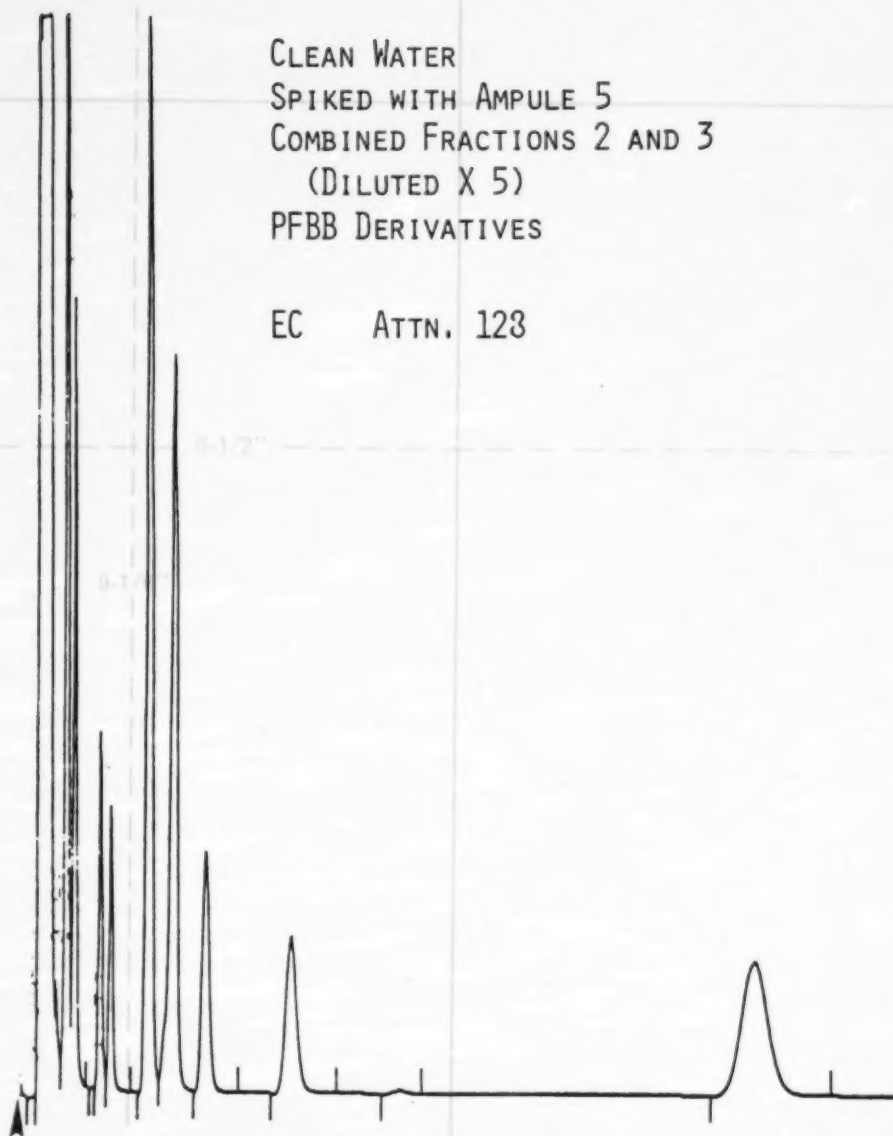


Figure A-10

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA;
DOTTED
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

CLEAN WATER
UNSPIKED
COMBINED FRACTIONS 4 AND 5
PFBB DERIVATIVES

EC ATTN. 128

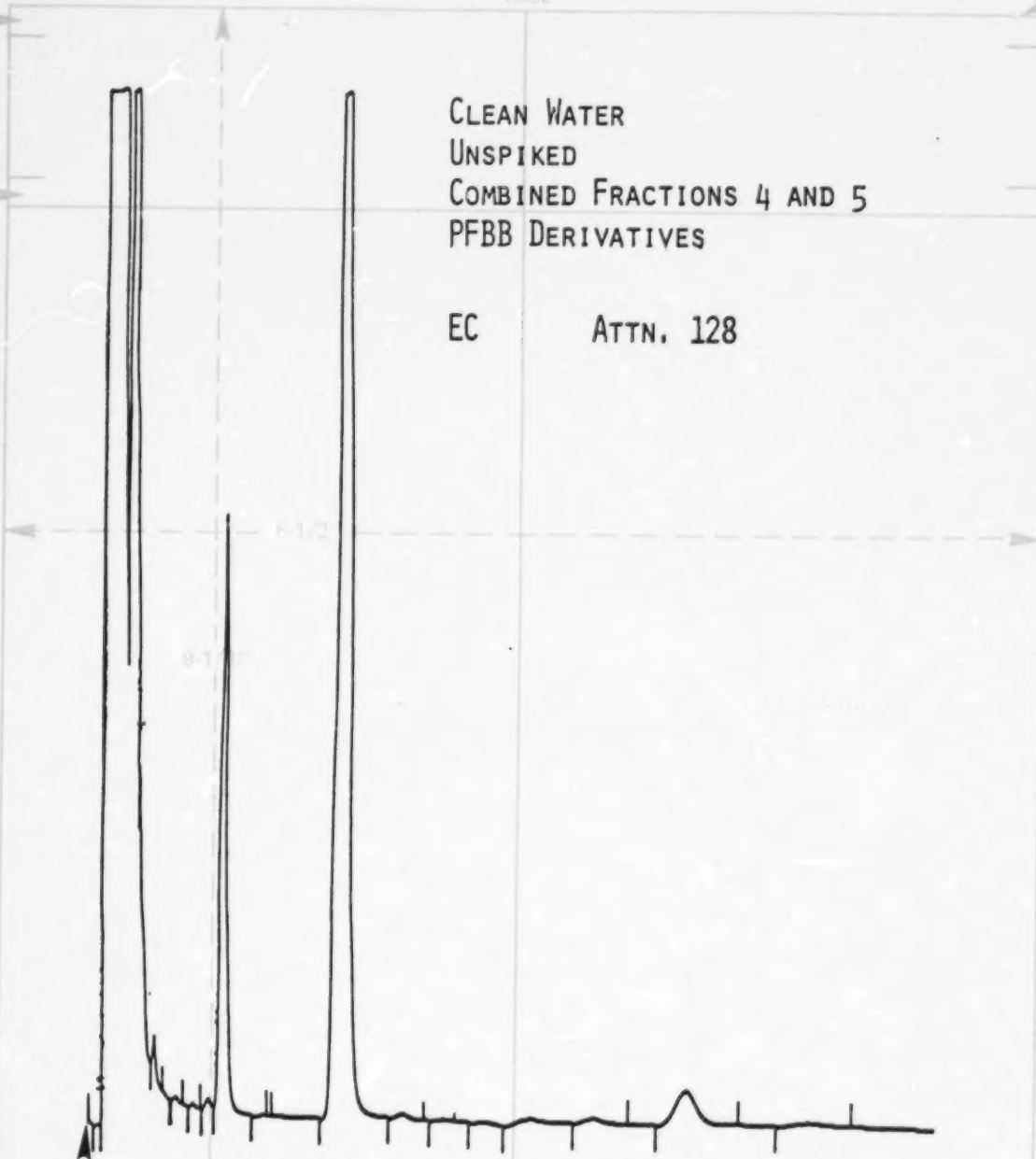


Figure A-11

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

235

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIB, EPA FORM 257)

PAGE NUMBER

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD.
BEGIN
SECTIONS
HERE

CLEAN WATER
SPIKED WITH AMPULE 5
COMBINED FRACTIONS 4 AND 5
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 128

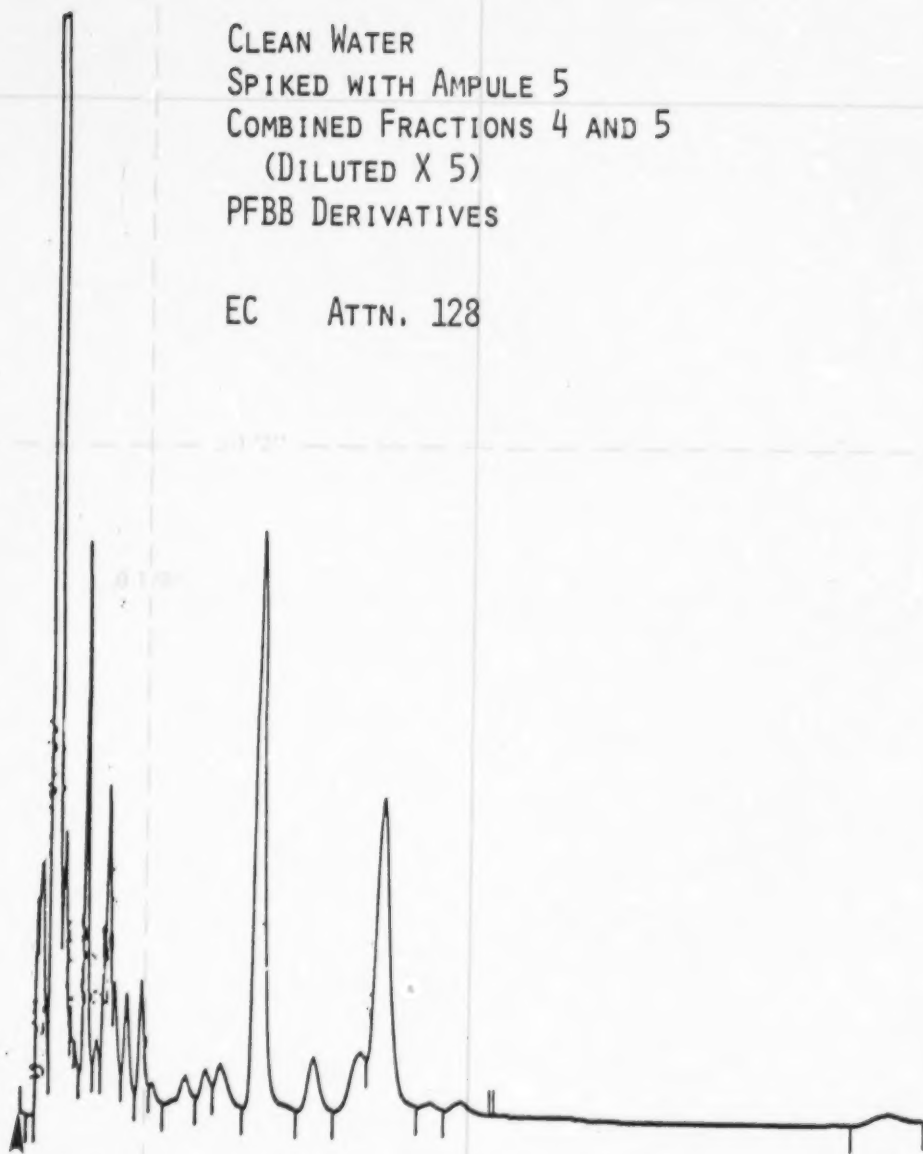


Figure A-12

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLE
AND FIGURE
LOCATIONS

EPA Form 2350-4 (8-80)

(PREVIOUSLY E-10, EPA FORM (8-77))

236

PAGE NUMBER

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD/
BEGIN
SECTIONS
HERE

WASTEWATER No. 1
UNSPIKED
COMBINED FRACTIONS 2 AND 3
(DILUTED X 2.5)
PFBB DERIVATIVES

EC ATTN. 128

6 1/2"

9 1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

237

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

EPA Form 2350-4 (4-80)

(PREVIOUSLY CEN. EPA FORM 287)

PAGE NUMBER

U.S. GOVERNMENT PRINTING OFFICE: 1975-500-000

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

WASTEWATER No. 1
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 2 AND 3
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 128

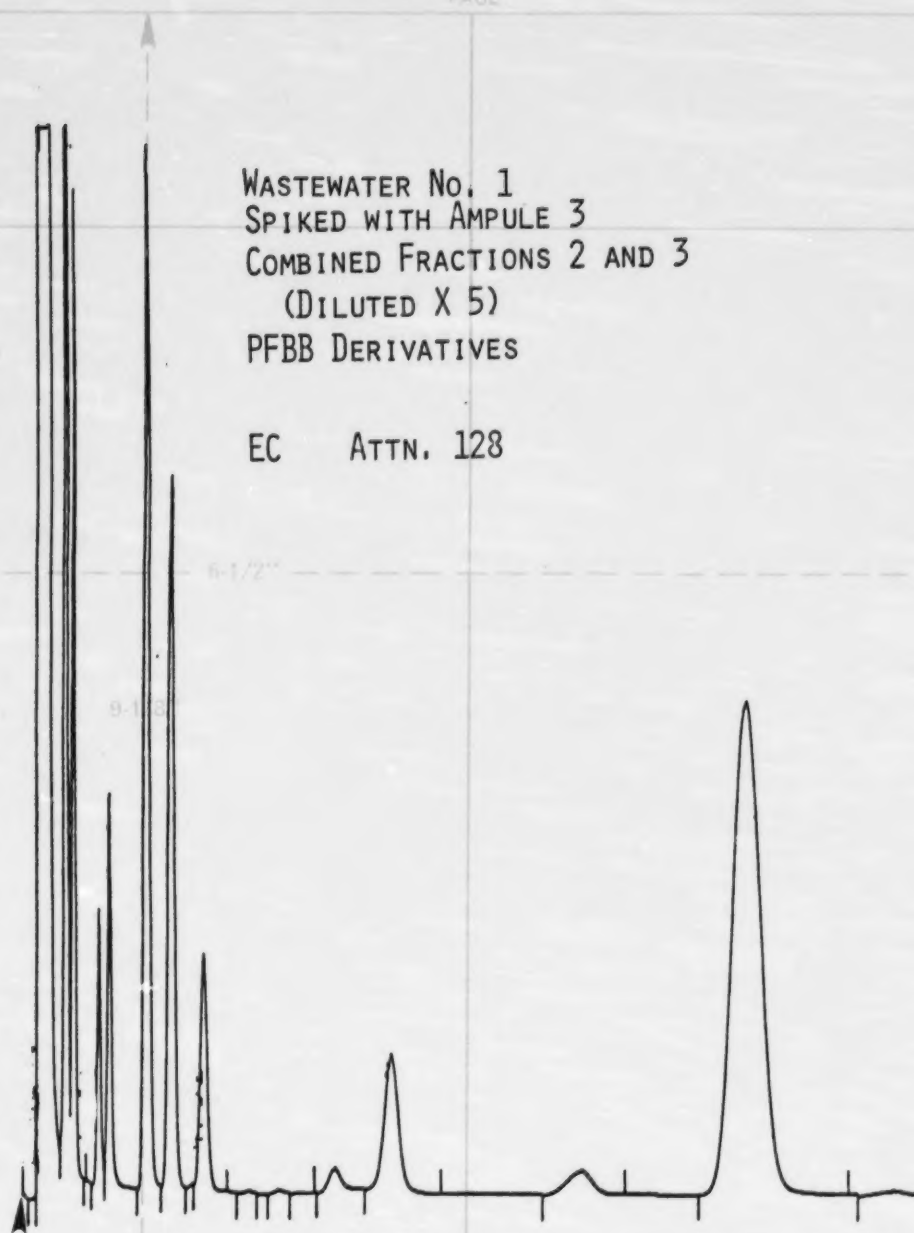


Figure A-14

BEGIN
LAST LINE
OF TEXT

3/8"

238

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

WASTEWATER No. 1
UNSPIKED
COMBINED FRACTIONS 4 AND 5
PFBB DERIVATIVES

EC ATTN. 128

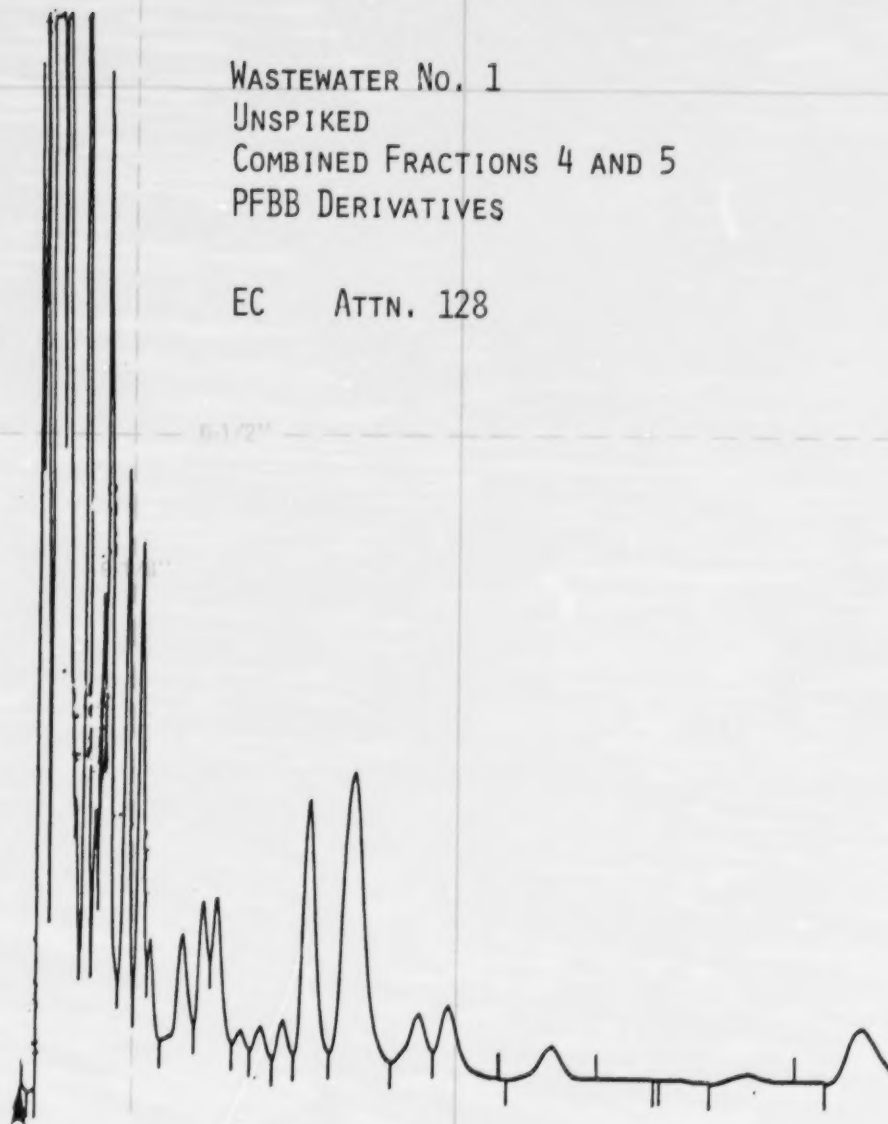


Figure A-15

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

WASTEWATER No. 1
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 4 AND 5
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 128X

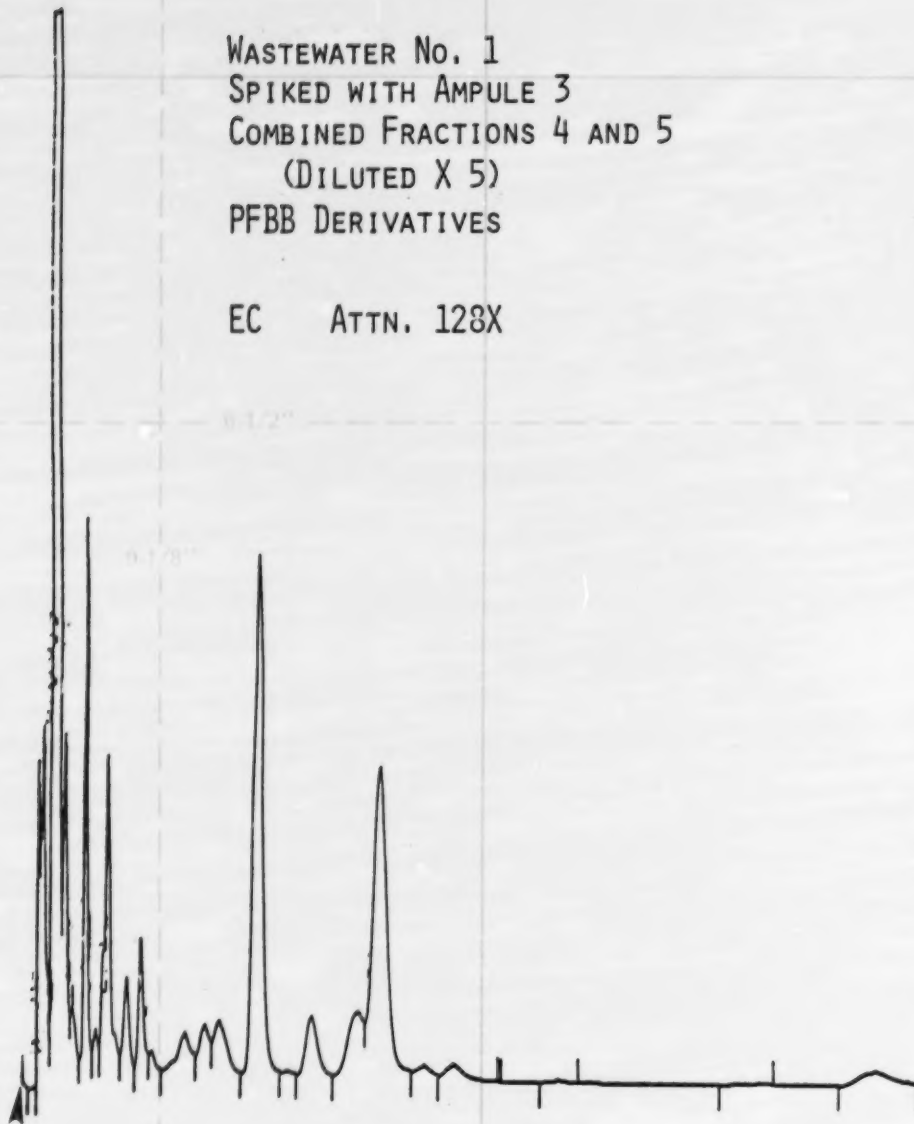


Figure A-16

BEGIN
LAST LINE
OF TEXT

3/8"

240

PAGE NUMBER

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLU-
STRATIONS

EPA Form 2250-4 (4-80)
(PREVIOUSLY ON EPA FORM 351)

TYPING GUIDE SHEET

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
UNSPIKED
COMBINED FRACTIONS 2 AND 3
(DILUTED X 2.5)
PFBB DERIVATIVES

EC ATTN. 128X

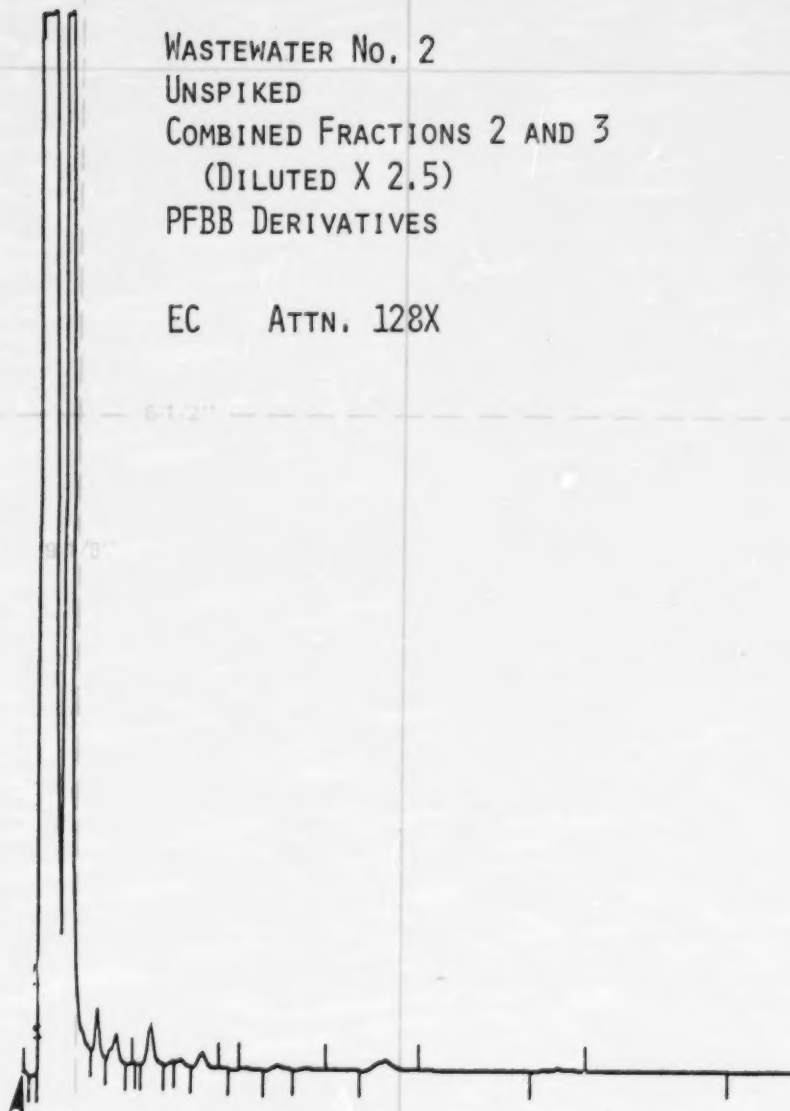


Figure A-17

BEGIN
LAST LINE
OF TEXT

3/8"

241

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 2 AND 3
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 128

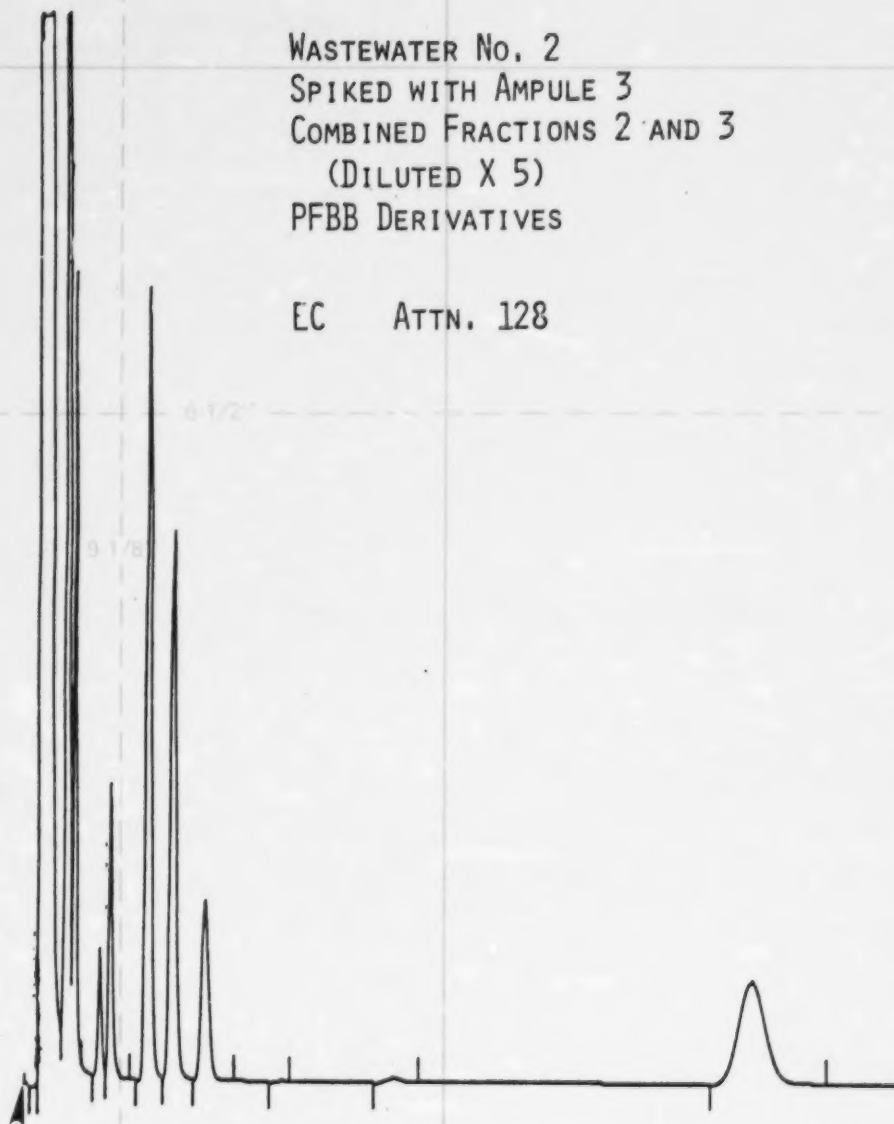


Figure A-18

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

242

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
UNSPIKED
COMBINED FRACTIONS 4 AND 5
(DILUTED X 2.5)
PFBB DERIVATIVES

EC ATTN. 128X

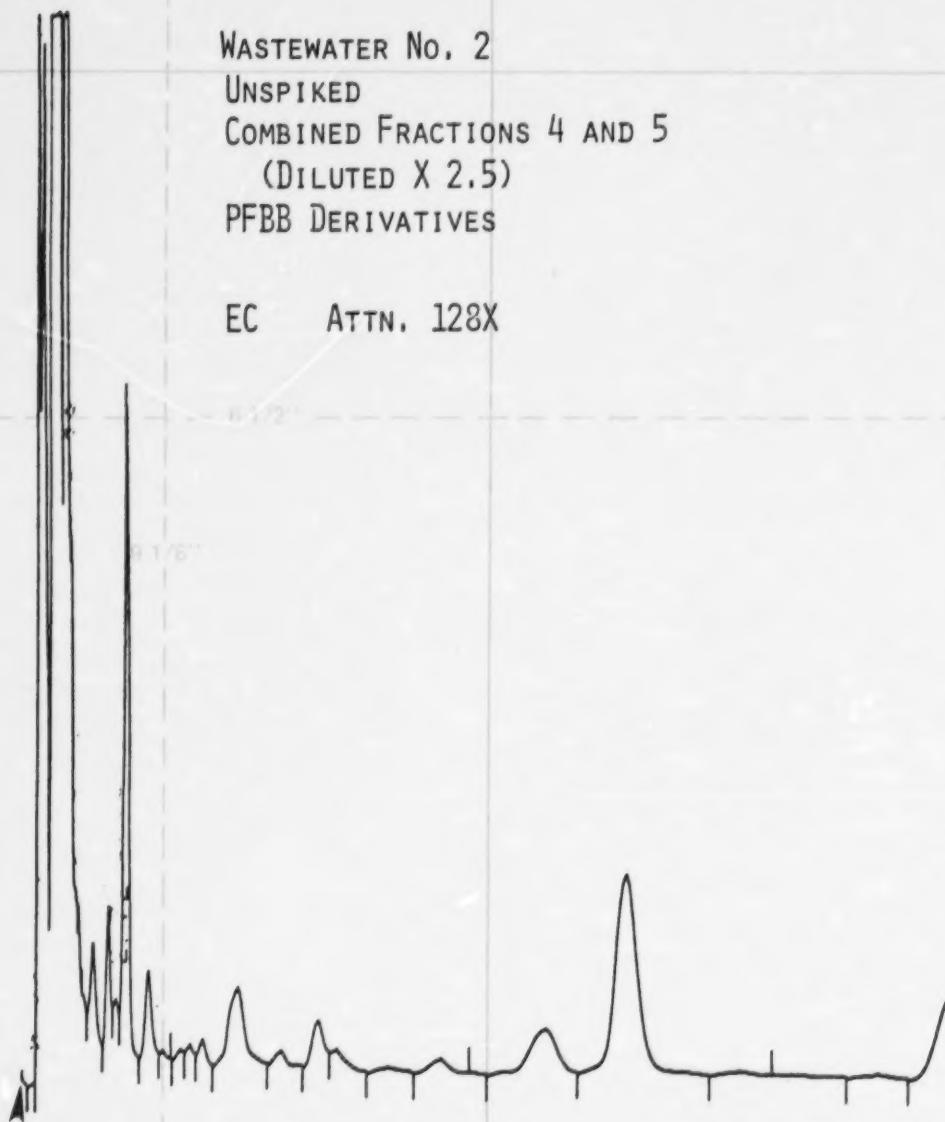


Figure A-19

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

WASTEWATER No. 2
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 4 AND 5
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 128X

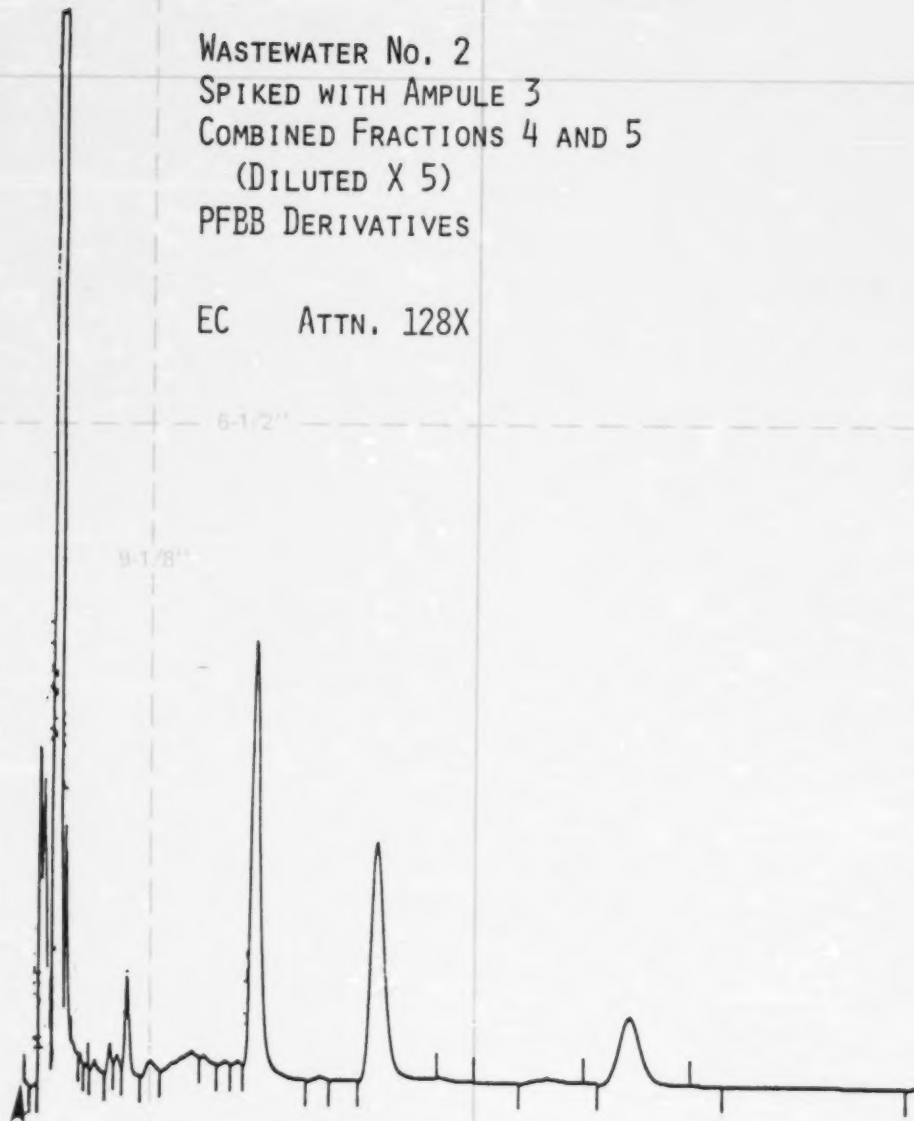


Figure A-20

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLU-
STRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
UNSPIKED
COMBINED FRACTIONS 2 AND 3
(DILUTED X 2.5)
PFBB DERIVATIVES

EC ATTN. 128X

8-1/2"

9-1/8"

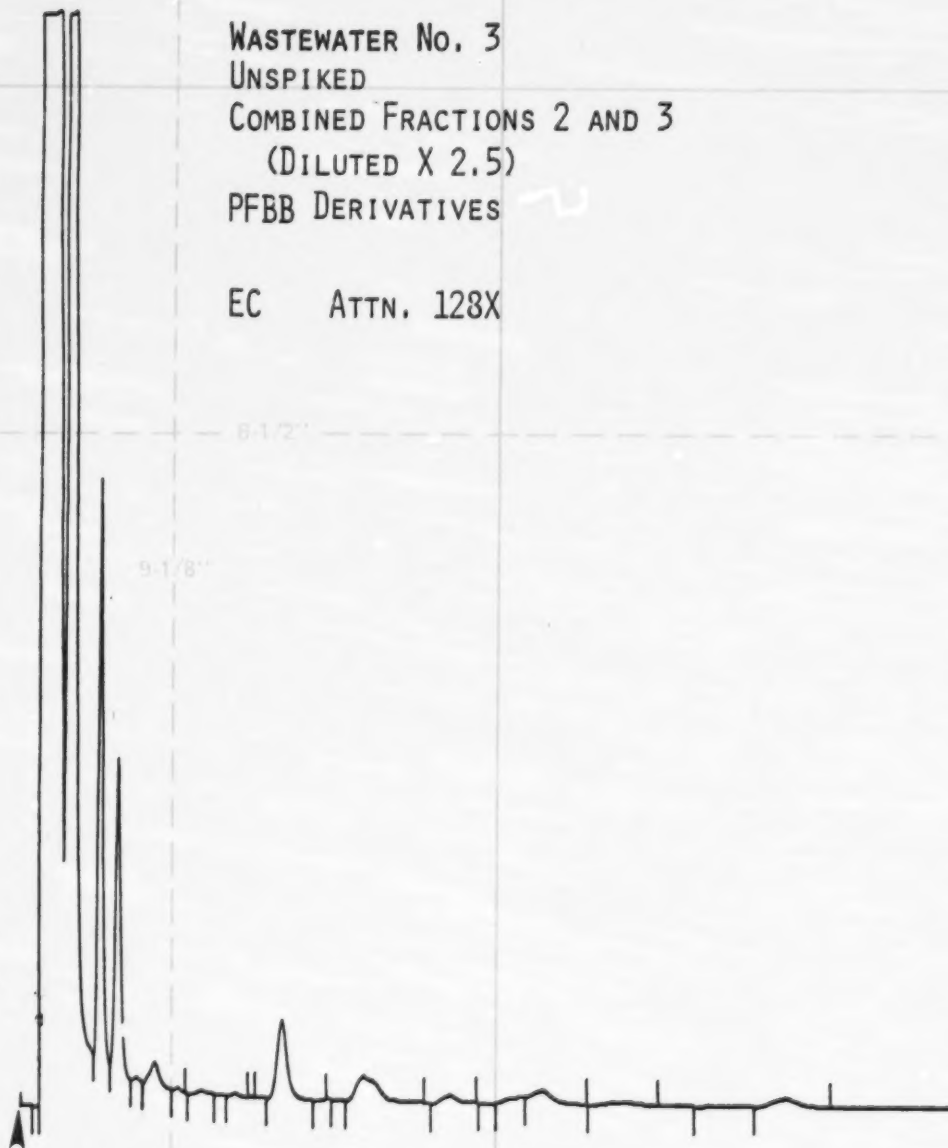


Figure A-21

BEGIN
LAST LINE
OF TEXT

3-7/8"

245

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 2 AND 3
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 256X

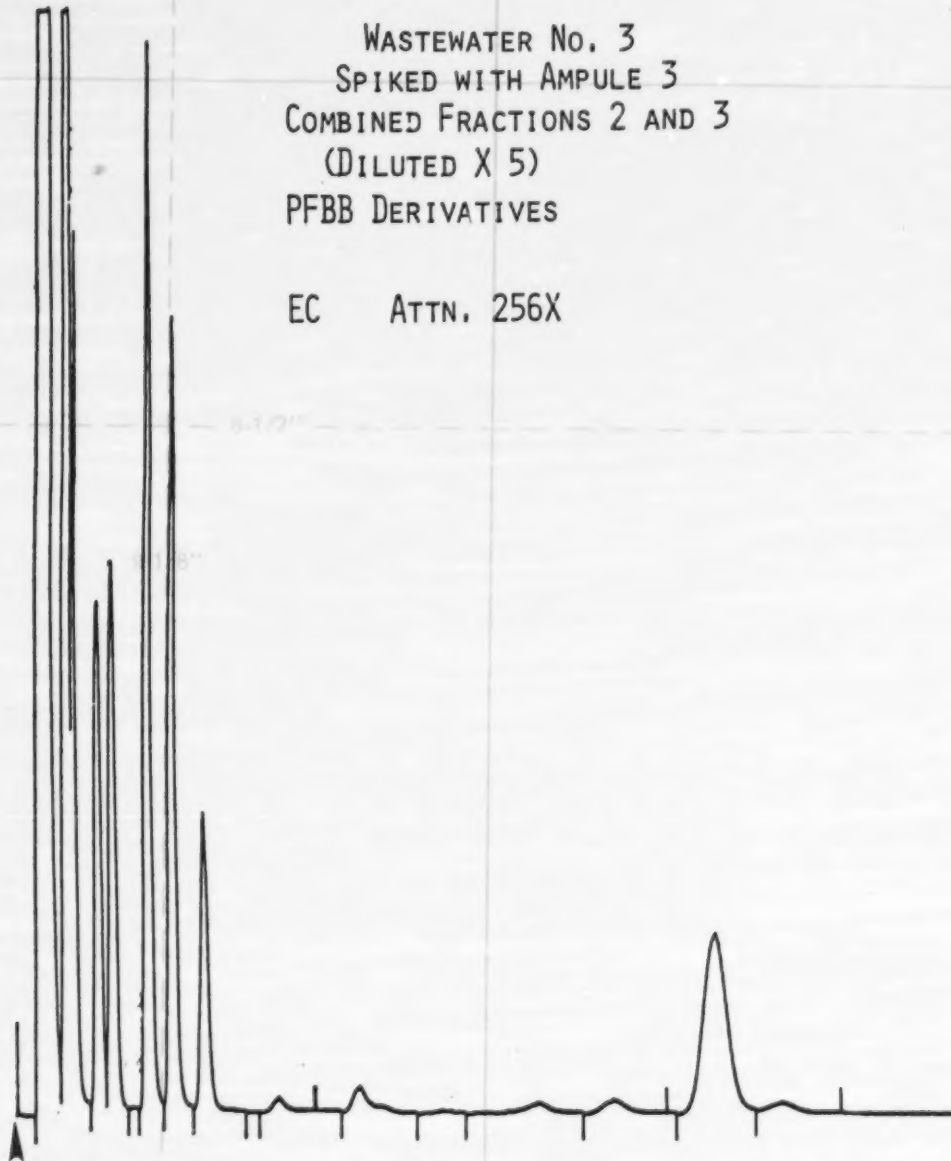


Figure A-22

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
CUTTING
DIMENSION
FOR TABLES
AND ILLU-
STRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
UNSPIKED
COMBINED FRACTIONS 4 AND 5
(DILUTED X 2.5)
PFBB DERIVATIVES

EC ATTN. 128X

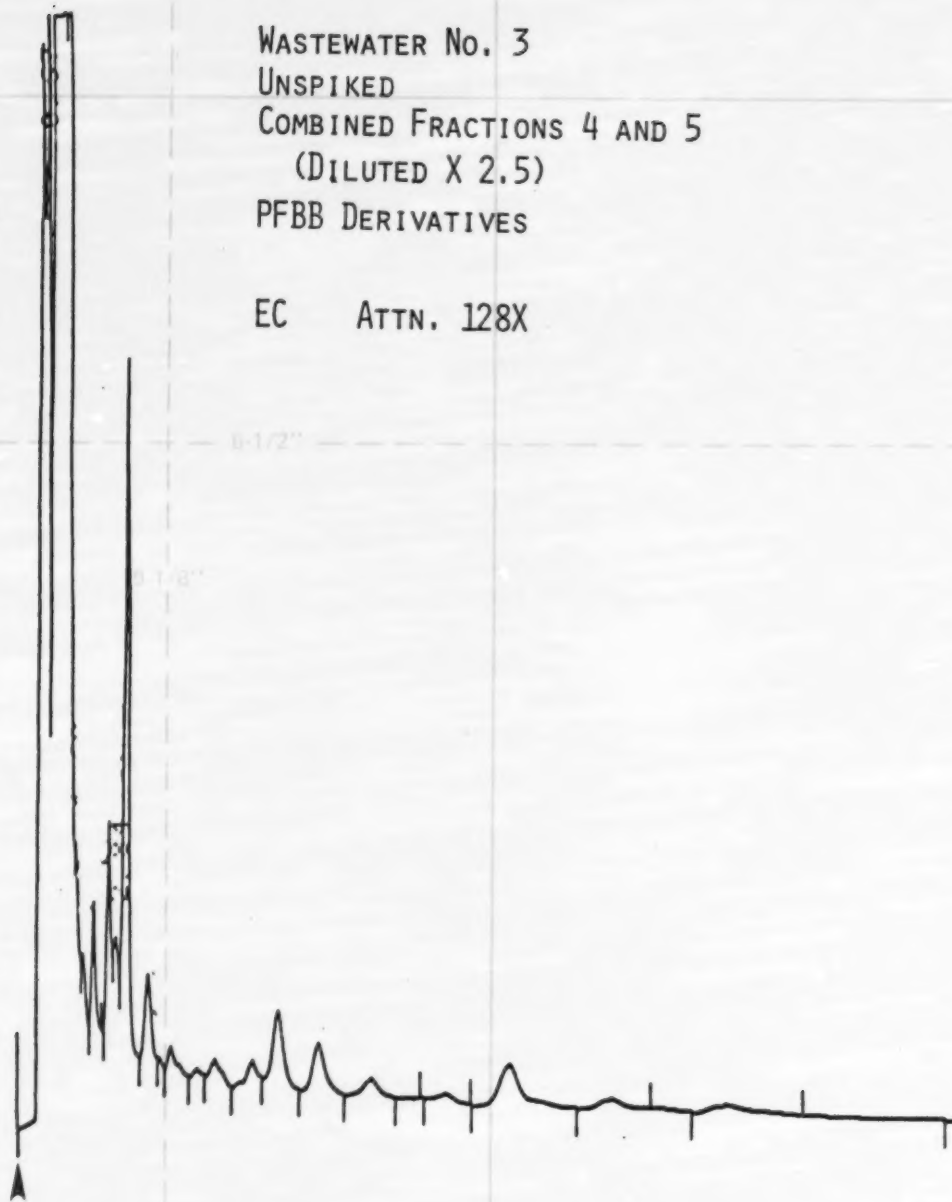


Figure A-23

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
LINES
AND ILLU-
STRATIONS

247

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

WASTEWATER No. 3
SPIKED WITH AMPULE 3
COMBINED FRACTIONS 4 AND 5
(DILUTED X 5)
PFBB DERIVATIVES

EC ATTN. 256

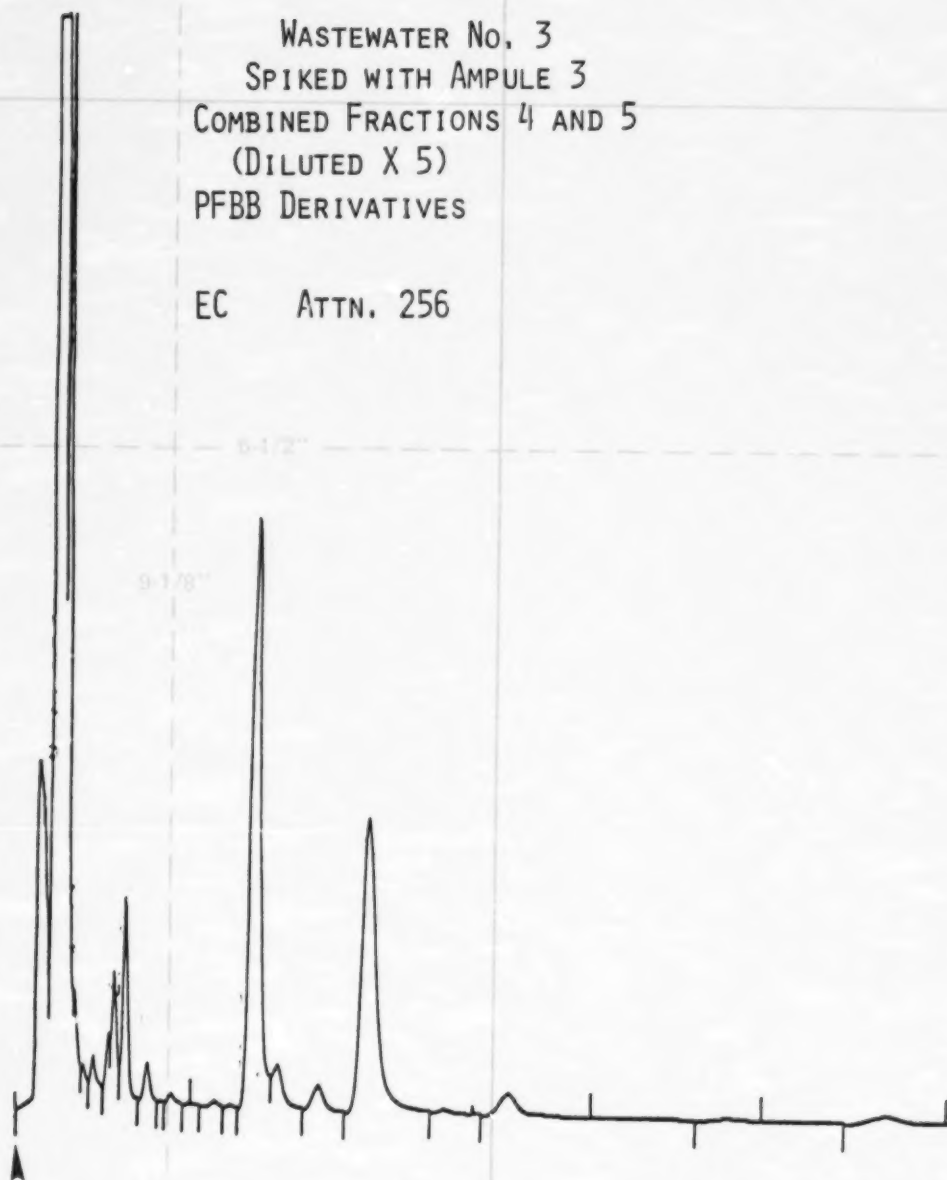


Figure A-24

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
(OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS)

248

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

APPENDIX B

PHENOLS: ANALYTICAL METHOD 604

1. Scope and Application

- 1.1 This method covers the determination of various phenolic compounds. The following parameters may be determined by this method:

Parameter	STORET No.	Parameter	STORET No.
4-Chloro-3-methyl-phenol	34452	2-Nitrophenol	34591
2-Chlorophenol	34586	4-Nitrophenol	34646
2,4-Dichlorophenol	34601	Pentachlorophenol	39094
2,4-Dimethylphenol	34606	Phenol	34694
4,6-Dinitro-2-methyl-phenol	34657	2,4,6-Trichloro-phenol	34621
2,4-Dinitrophenol	34616		

- 1.2 This method is applicable to the determination of these compounds in municipal and industrial discharges. It is designed to be used to meet the monitoring requirements of the National Pollutant Discharge Elimination System (NPDES). As such, it presupposes a high expectation of finding the specific compounds of interest. If the user is attempting to screen samples for any or all of the compounds above, he must develop independent protocols for the verification of identity.
- 1.3 The sensitivity of this method is usually dependent on the level of interferences rather than instrumental limitations. The limits of detection represent sensitivities that can be achieved in wastewaters with a flame ionization detector in the absence of interferences. If derivatization clean up is required, the sensitivity of the method is 10 µg/L. This concentration represents the minimum amount proven to date to give reproducible and linear response during derivatization.
- 1.4 This method is recommended for use only by experienced residue analysts or under the close supervision of such qualified persons.

BEGIN
LAST LINE
OF TEXT

3/8"

249

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

2. Summary of Method

- 2.1 A 1 liter sample of wastewater is acidified and extracted with methylene chloride using separatory funnel techniques. The extract is dried and concentrated to a volume of 10 mL or less. Flame ionization gas chromatographic conditions are described which allow for the accurate measurement of the compounds in the extract.
- 2.2 The method also provides for the preparation of pentafluorobenzyl bromide (PFBB) derivatives for electron capture gas chromatography with additional clean up procedures to aid the analyst in the elimination of interferences.

3. Interferences

- 3.1 Solvents, reagents, glassware, and other sample processing hardware may yield discrete artifacts and/or elevated baselines causing misinterpretation of gas chromatograms. All these materials must be demonstrated to be free from interferences under the conditions of the analysis by running method blanks. Specific selection of reagents and purification of solvents by distillation in all glass systems may be required.
- 3.2 Interferences coextracted from the samples will vary considerably from source to source, depending on the diversity of the industrial complex or municipality being sampled. While general clean up techniques are provided as part of this method, unique samples may require additional clean up.

4. Apparatus and Materials

- 4.1 Sampling equipment, for discrete or composite sampling.
- 4.1.1 Grab sample bottle - Amber glass, 1 liter or 1 quart volume. French or Boston Round design is recommended. The container must be washed and rinsed with solvent before use to minimize interferences.
- 4.1.2 Bottle caps - Threaded to screw on sample bottles. Caps must be lined with Teflon.
- 4.1.3 Compositing equipment - Automatic or manual compositing system. Must incorporate glass sample containers for the collection of a minimum of 250 mL. Sample containers must be kept refrigerated during sampling. No tygon or rubber tubing or fittings may be used in this system.
- 4.2 Separatory funnel - 2000 mL, with Teflon stopcock.

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
DIMENSION
FOR TABLES
AND LINE
TRATIONS

3/8"

250

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTIONS
HERE

- 4.3 Drying column - 20 mm ID Pyrex chromatographic column with coarse frit.
- 4.4 Kuderna-Danish (K-D) apparatus
- 4.4.1 Concentrator tube - 10 mL, graduated (Kontes K-570050-1025 or equivalent). Calibration must be checked. Ground glass stopper (size 19/22 joint) is used to prevent evaporation of extracts.
- 4.4.2 Evaporative flask - 500 mL (Kontes K-57001-0500 or equivalent). Attach to concentrator tube with springs. (Kontes K-662750-0012).
- 4.4.3 Snyder column - two ball micro (Kontes K-503000-0121 or equivalent).
- 4.4.4 Snyder column - two ball micro (Kontes K-569001-0219 or equivalent).
- 4.4.5 Boiling chips - solvent extracted, approximately 10/40 mesh.
- 4.5 Water bath - Heated, with concentric ring cover, capable of temperature control ($\pm 2^{\circ}\text{C}$). The bath should be used in a hood.
- 4.6 Gas chromatograph - Analytical system complete with gas chromatograph suitable for on column injection and all required accessories including both flame ionization and electron capture detector, column supplies, recorder, gases, syringes. A data system for measuring peak areas is recommended.
- 4.7 Chromatographic column - 10 mm ID by 100 mm length, with Teflon stopcock.
- 4.8 Reaction vial - 20 mL with Teflon-lined cap.

5. Reagents

5.1 Preservatives

- 5.1.1 Sodium hydroxide - (ASC) 10 N in distilled water.
- 5.1.2 Sulfuric acid - (1 + 1) Mix equal volumes of conc. H_2SO_4 (ACS) with distilled water.
- 5.1.3 Sodium thiosulfate - (ACS) granular.

- 5.2 Methylene chloride, acetone, 2-propanol, hexane, toluene - Pesticide quality or equivalent.

BEGIN
LAST LINE
OF TEXT

3/8"

251

PAGE NUMBER

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

- 5.3 Sodium sulfate - (ACS) Granular, anhydrous (purified by heating at 400°C for 4 hr in a shallow tray).
- 5.4 Stock standards - Prepare stock standard solutions at a concentration of 1.00 µg/µL by dissolving 0.100 grams of assayed reference material in pesticide quality 2-propanol and diluting to volume in a 100 mL ground glass stoppered volumetric flask. The stock solution is transferred to ground glass stoppered reagent bottles, stored in a refrigerator, and checked frequently for signs of degradation or evaporation, especially just before preparing working standards from them.
- 5.5 Sulfuric acid - (ACS) 1 N in distilled water.
- 5.6 Potassium carbonate - (ACS) powdered.
- 5.7 Pentafluorobenzyl bromide (α-bromopentafluorotoluene) - 97% minimum purity.
- 5.8 1,4,7,10,13,16 - Hexaoxacyclooctadecane (18 crown 6) - 98% minimum purity.
- 5.9 Derivatization reagent - Add 1 mL pentafluorobenzyl bromide and 1 gram 18 crown 6 to a 50 mL volumetric flask and dilute to volume with 2-propanol. Prepare fresh weekly.
- 5.10 Silica gel - (ACS) 100/200 mesh, grade 923; activated at 130°C and stored in a desiccator.

6. Calibration

- 6.1 Prepare calibration standards for the flame ionization detector that contain the compounds of interest, either singly or mixed together. The standards should be prepared at concentrations covering two or more orders of magnitude that will completely bracket the working range of the chromatographic system. If the sensitivity of the detection system can be calculated as 100 µg/L in the final extract, for example, prepare standards at 10 µg/L, 50 µg/L, 100 µg/L, 500 µg/L, etc. so that injections of 1 to 5 µL of each calibration standard will define the linearity of the detector in the working range.
- 6.2 Assemble the necessary gas chromatographic apparatus and establish operating parameters equivalent to those indicated in Table 1. By injecting calibration standards, establish the sensitivity limit of the detector and linear range of the analytical system for each compound.
- 6.3 Before using the derivatization clean up procedure, the analyst must process a series of calibration standards through the procedure to validate the precision of the derivatization and the absence of interferences from the reagents.

BEGIN
LAST LINE
OF TEXT

3/8"

252

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

7. Quality Control

- 7.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank that all glassware and reagents are free from interference. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination.
- 7.2 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be analyzed to validate the accuracy of the analysis. Where doubt exists over the identification of a peak on the chromatogram, confirmatory techniques such as mass spectroscopy should be used.

8. Sample Collection, Preservation, and Handling

- 8.1 Grab samples must be collected in glass containers. Conventional sampling practices should be followed, except that the bottle must not be prewashed with sample before collection. Composite samples should be collected in refrigerated glass containers in accordance with the requirements of the program. Automatic sampling equipment must be free of tygon and other potential sources of contamination.
- 8.2 The samples must be iced or refrigerated from the time of collection until extraction. At the sampling location fill the glass container with sample. Add 35 mg sodium thiosulfate per part per million free chlorine per liter. Adjust the sample pH to approximately 2, as measured by pH paper, using appropriate sulfuric acid solution or 10 N sodium hydroxide. Record the volume of acid used on the sample identification tag so the sample volume can be corrected later.
- 8.3 All samples must be extracted within 7 days and completely analyzed within 30 days of collection.

9. Sample Extraction

- 9.1 Mark the water meniscus on the side of the sample bottle for later determination of sample volume. Pour the entire sample into a two liter separatory funnel. Adjust the sample pH to 12 with sodium hydroxide.
- 9.2 Add 60 mL methylene chloride to the sample bottle, seal, and shake 30 seconds to rinse the inner walls. Transfer the solvent into the separatory funnel, and extract the sample by shaking the funnel for one minute with periodic venting to release vapor pressure. Allow the organic layer to separate from the water

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

phase for a minimum of ten minutes. If the emulsion interface between layers is more than one-third the size of the solvent layer, the analyst must employ mechanical techniques to complete the phase separation. The optimum technique depends on the sample, but may include stirring, filtration of the emulsion through glass wool, or centrifugation. Discard the methylene chloride layer, and wash the sample with an additional two 60 mL portions of methylene chloride in similar fashion.

- 9.3 Adjust the aqueous layer to a pH of 1 to 2 with sulfuric acid.
- 9.4 Add 60 mL methylene chloride to the sample and shake for two minutes. Allow the solvent to separate from the sample and collect the methylene chloride in a 250 mL Erlenmeyer flask.
- 9.5 Add a second 60 mL volume of methylene chloride to the sample bottle and complete the extraction procedure a second time, combining the extracts in the Erlenmeyer flask.
- 9.6 Perform a third extraction in the same manner. Pour the combined extract through a drying column containing 3 to 4 inches of anhydrous sodium sulfate, and collect it in a 500 mL Kuderna-Danish (K-D) flask equipped with a 10 mL concentrator tube. Rinse the Erlenmeyer flask and column with 20 to 30 mL methylene chloride to complete the quantitative transfer.
- 9.7 Add 1 to 2 clean boiling chips to the flask and attach a three ball Snyder column. Prewet the Snyder column by adding about 1 mL methylene chloride to the top. Place the K-D apparatus on a steaming hot (60 to 65°C) water bath so that the concentrator tube is partially immersed in the hot water and the entire lower rounded surface of the flask is bathed in vapor. Adjust the vertical position of the apparatus and the water temperature as required to complete the concentration in 15 to 20 minutes. At the proper rate of distillation the balls of the column will actively chatter but the chambers will not flood. When the apparent volume of liquid reaches 1 mL, remove the K-D apparatus and allow it to drain for at least 10 minutes while cooling.
- 9.8 Increase the temperature of the hot water bath to 95 to 100°C. Remove the Snyder column and rinse the flask and its lower joint into the concentrator tube with 1 to 2 mL of 2-propanol. A 5-mL syringe is recommended for this operation. Attach a micro-Snyder column to the concentrator tube and prewet the column by adding about 0.5 mL of 2-propanol to the top. Place the micro-K-D apparatus on the water bath so that the concentrator tube is partially immersed in the hot water. Adjust the vertical position of the apparatus and the water temperature as required to complete concentration in 5 to 10 minutes. At the proper rate of distillation the balls of the column will actively chatter but the chambers will not flood. When the apparent volume of the liquid reaches 2.5 mL, remove the K-D apparatus

BEGIN
LAST LINE
OF TEXT

3/8"

254

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

and allow it to drain for at least 10 minutes while cooling. Add an additional 2 mL of 2-propanol through the top of the micro-Snyder column and resume concentrating as before. When the apparent volume of liquid reaches 0.5 mL, remove the K-D apparatus and allow it to drain for at least 10 minutes while cooling. Remove the micro-Snyder column and rinse its lower joint into the concentrator tube with a minimum amount of 2-propanol. Adjust the extract volume to 1.0 mL. Stopper the concentrator tube and store in refrigerator if further processing will not be performed immediately. If the sample extract requires no further clean up, proceed with flame ionization gas chromatographic analysis. If the sample requires clean up, proceed to Section 11.

- 9.9 Determine the original sample volume by refilling the sample bottle to the mark and transferring the liquid to a 1000 mL graduated cylinder. After correction for sulfuric acid preservative, record the sample volume to the nearest 5 mL.

10. Gas Chromatography - Flame Ionization Detector

- 10.1 Table 1 summarizes some recommended gas chromatographic column materials and operating conditions for the instrument. Included in this table are estimated retention times and sensitivities that should be achieved by this method. An example of the separation achieved by one of these columns is shown in Figure 1. Calibrate the gas chromatographic system daily with a minimum of three injections of calibration standards.
- 10.2 Inject 2 to 5 mL of the sample extract using the solvent flush technique. Smaller (1.0 mL) volumes can be injected if automatic devices are employed. Record the volume injected to the nearest 0.05 μ L, and the resulting peak size, in area units.
- 10.3 If the peak area exceeds the linear range of the system, dilute the extract and reanalyze.
- 10.4 If the peak area measurement is prevented by the presence of interferences, the phenols must be derivatized and analyzed by electron capture gas chromatography.

11. Derivatization and Electron Capture Gas Chromatography

- 11.1 Pipet a 1.0 mL aliquot of the 2-propanol solution of standard or sample extract into a glass reaction vial. Add 1.0 mL derivatization reagent. This is a sufficient amount of reagent to derivatize a solution whose total phenolic content does not exceed 0.3 mg/mL.
- 11.2 Add about 3 mg potassium carbonate to the solution and shake gently.

BEGIN
LAST LINE
OF TEXT

3/8"

255

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD;
BEGIN
SECTION
HERE

- 11.3 Cap the mixture and heat it for 4 hours at 80°C in a hot water bath.
- 11.4 Remove the solution from the hot water bath and allow it to cool.
- 11.5 Add 10 mL hexane to the reaction vial and shake vigorously for one minute. Add 3.0 mL distilled, deionized water to the reaction vial and shake for two minutes.
- 11.6 Decant organic layer into a concentrator tube and cap with a glass stopper.
- 11.7 Pack a 10 mm ID chromatographic column with 4.0 grams of activated silica gel. After settling the silica gel by tapping the column, add about 2.0 grams of anhydrous sodium sulfate to the top.
- 11.8 Pre-elute the column with 6 mL hexane. Discard the eluate and just before exposure of the sulfate layer to air, pipet onto the column 2.0 mL of the hexane solution (11.6) that contains the derivatized sample or standard. Elute the column with 10.0 mL hexane (Fraction 1) and discard this fraction. Elute the column, in order, with: 10.0 mL 15% toluene in hexane (Fraction 2); 10.0 mL 40% toluene in hexane (Fraction 3); 10.0 mL 75% toluene in hexane (Fraction 4); and 10.0 mL 15% propanol in toluene (Fraction 5). Elution patterns for the phenolic derivatives are shown in Table 2. Fractions may be combined as desired, depending on the specific phenols of interest or level of interferences.
- 11.9 Analyze the fractions by electron capture gas chromatography. Table 2 summarizes some recommended gas chromatographic column materials and operating conditions for the instrument. Included in this table are estimated retention times and sensitivities that should be achieved by this method. Examples of the separation achieved by this column are shown in Figure 2. Calibrate the system daily with a minimum of three aliquots of calibration standards, containing each of the phenols of interest that are derivatized according to the procedure.
- 11.10 Inject 2 to 5 μL of the column fractions using the solvent-flush technique. Smaller (1.0 μL) volumes can be injected if automatic devices are employed. Record the volume injected to the nearest 0.05 μL , and the resulting peak size, in area units. If the peak area exceeds the linear range of the system, dilute the extract and reanalyze.

BEGIN
LAST LINE
OF TEXT

3/8"

256

BOTTOM OF
IMAGE AREA;
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

12. Calculations

- 12.1 Determine the concentration of individual compounds measured by the flame ionization procedure (without derivatization) according to the formula:

$$\text{Concentration, } \mu\text{g/L} = \frac{(A)(B)(V_t)}{(V_i)(V_s)}$$

Where: A = Calibration factor for chromatographic system, in nanograms material per area unit

B = Peak size in injection of sample extract, in area units

V_i = Volume of extract injected (μL)

V_t = Volume of total extract (μL)

V_s = Volume of water extracted (mL)

- 12.2 Determine the concentration of individual compounds measured by the derivatization and electron capture method according to the following procedure.

12.2.1 From the concentration of the calibration standards that were derivatized with the samples, calculate the amounts in nanograms of underivatized phenols that were added as 2-propanol solution (11.1). From the size of the injection into the electron capture gas chromatograph, determine the nanograms of material (calculated as the underivatized phenol) injected onto the column. Compare the detector responses obtained to develop a calibration factor for the chromatographic system, in nanograms of material per area unit.

- 12.2.2 Determine the concentration of individual compounds according to the formula:

$$\text{Concentration, } \mu\text{g/L} = \frac{(A)(B)(V_t)(10)(D)}{(V_i)(V_s)(C)(E)}$$

Where: A = Calibration factor for chromatographic system, in nanograms material per area unit, calculated as underivatized phenol

B = Peak size in injection of sample extract, in area units

V_i = Volume of eluate injected (μL)

V_t = Total volume of column eluate (μL)

V_s = Volume of water extracted (mL)

C = Volume of hexane sample solution added to clean up column, in mL

D = Total volume of 2-propanol extract after concentration

E = Volume of 2-propanol extract used for derivatization

BEGIN
LAST LINE
OF TEXT

3'8"

257

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

12.3 Report results in micrograms per liter without correction for recovery data. When duplicate and spiked samples are analyzed, all data obtained should be reported.

13. Accuracy and Precision

DROPPED
HEAD;
BEGIN
SECTIONS
HERE

The U.S. EPA Environmental Monitoring and Support Laboratory in Cincinnati is in the process of conducting an interlaboratory method study to determine the accuracy and precision of the test procedure.

1 1/2"

9 1/8"

BEGIN
LAST LINE
OF TEXT

3/8"

258

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

TABLE 1. FLAME IONIZATION GAS CHROMATOGRAPHY OF PHENOLS

Compounds ^a	Retention Time (Minutes)	Detection Limit (ug/L) ^b
2-Chlorophenol	2.29	2.0
2-Nitrophenol	2.83	2.5
Phenol	3.71	1.4
2,4-Dimethylphenol	4.82	1.7
2,4-Dichlorophenol	5.10	2.1
2,4,6-Trichlorophenol	7.16	5.0
4-Chloro-3-methyl-phenol	8.55	8.3
2,4-Dinitrophenol	11.57	7.0
4,6-Dinitro-2-methylphenol	11.88	10.0
Pentachlorophenol	13.64	10.0
4-Nitrophenol	22.41	10.0

^aColumn conditions: Supelcoport 100/120 mesh coated with 1% SP-1240 DA in 6 ft long X 2 mm ID glass column with nitrogen carrier gas at 30 mL/min flow rate. Column temperature is 100°C at injection, programmed immediately at 8°C/min to 180°C final temperature.

^bDetection limit is calculated from the minimum detectable GC response being equal to five times the GC background noise, assuming a 10 mL final extract volume of the 1 liter sample extract, and assuming a GC injection of 5 microliters.

T-24.3

BEGIN
LAST LINE
OF TEXT

3/8"

259

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

TABLE 2. ELECTRON CAPTURE GAS CHROMATOGRAPHY OF PFBB DERIVATIVES

Parent Compound ^a	Retention Time (minutes)	Recovery Percent by Fraction				
		1	2	3	4	5
2-Chlorophenol	3.5			90	>1	
2-Nitrophenol	9.5				9	90
Phenol	2.0			90	10	
2,4-Dimethylphenol	3.0			95	7	
2,4-Dichlorophenol	6.0			95	>1	
2,4,6-Trichlorophenol	7.3		50	50		
4-Chloro-3-methyl- phenol	5.0			84	14	
Pentachlorophenol	29.7		75	20		
4-Nitrophenol	14.5				>1	90
(2,4-Dinitrophenol)	46.9					
(2-Methyl-4,6-dinitrophenol)	36.6					

^aColumn conditions: Chromosorb W-AW-DMCS 80/100 mesh coated with 5% OV-17 packed in a 1.8 m long X 2.0 mm ID glass column with 5% methane/95% argon carrier gas at 30 mL/min flow rate. Column temperature is 200°C.

T-24.4

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLE
AND ILLU-
STRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD:
BEGIN
SECTIONS
HERE

COLUMN: 1% SP-1240DA ON SUPELCOPORT
PROGRAM: 100° C.-0 MINUTES 8°/MINUTE TO 180° C
DETECTOR: FLAME IONIZATION

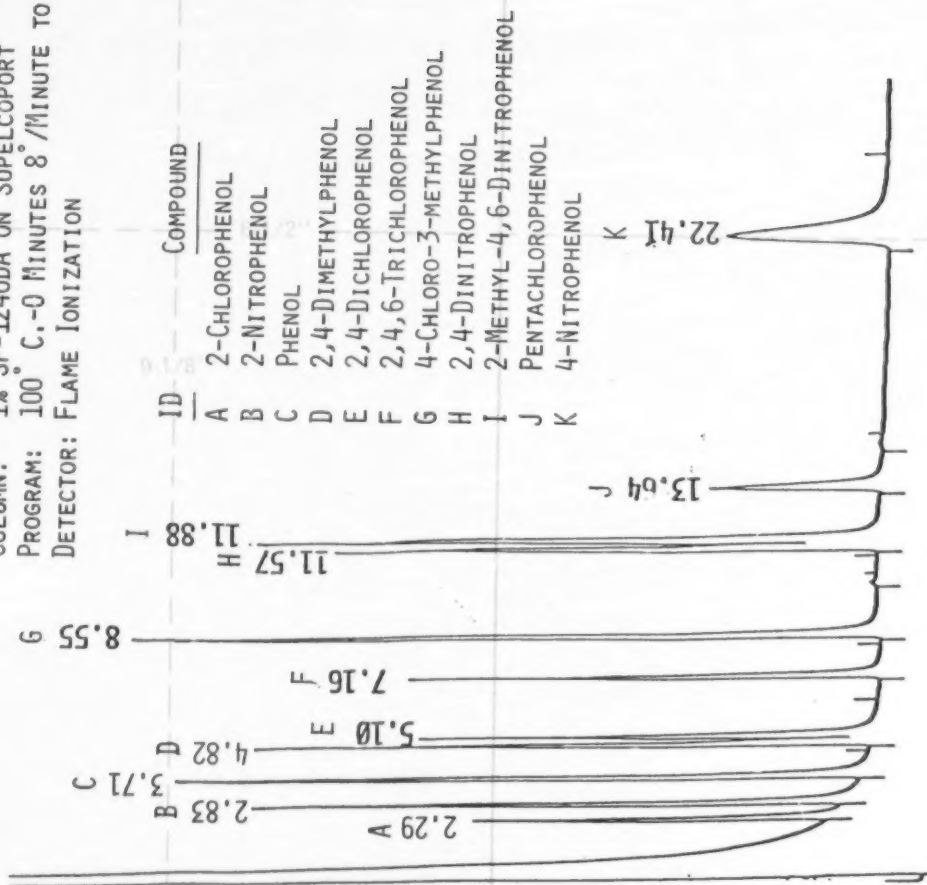


FIGURE 1. GAS CHROMATOGRAM OF PHENOLS

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA,
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS

BEGIN
FIRST
LINE OF
TEXT
HERE

CENTER OF
PAGE

TOP OF
IMAGE
AREA

DROPPED
HEAD,
BEGIN
SECTION
HERE

COLUMN: 5% OV-17 ON CHROMOSORB W-AW
TEMPERATURE: 200°C
DETECTOR: ELECTRON CAPTURE

STANDARD PFB DERIVATIVES	
A	PHENOL
B	2,4-DIMETHYLPHENOL
C	2-CHLOROPHENOL
D	4-CHLORO-3-METHYL PHENOL
E	2,4-DICHLOROPHENOL
F	2,4,6-TRICHLORO- PHENOL
G	PHENOL
H	2-NITROPHENOL
I	4-NITROPHENOL
	PENTACHLOROPHENOL

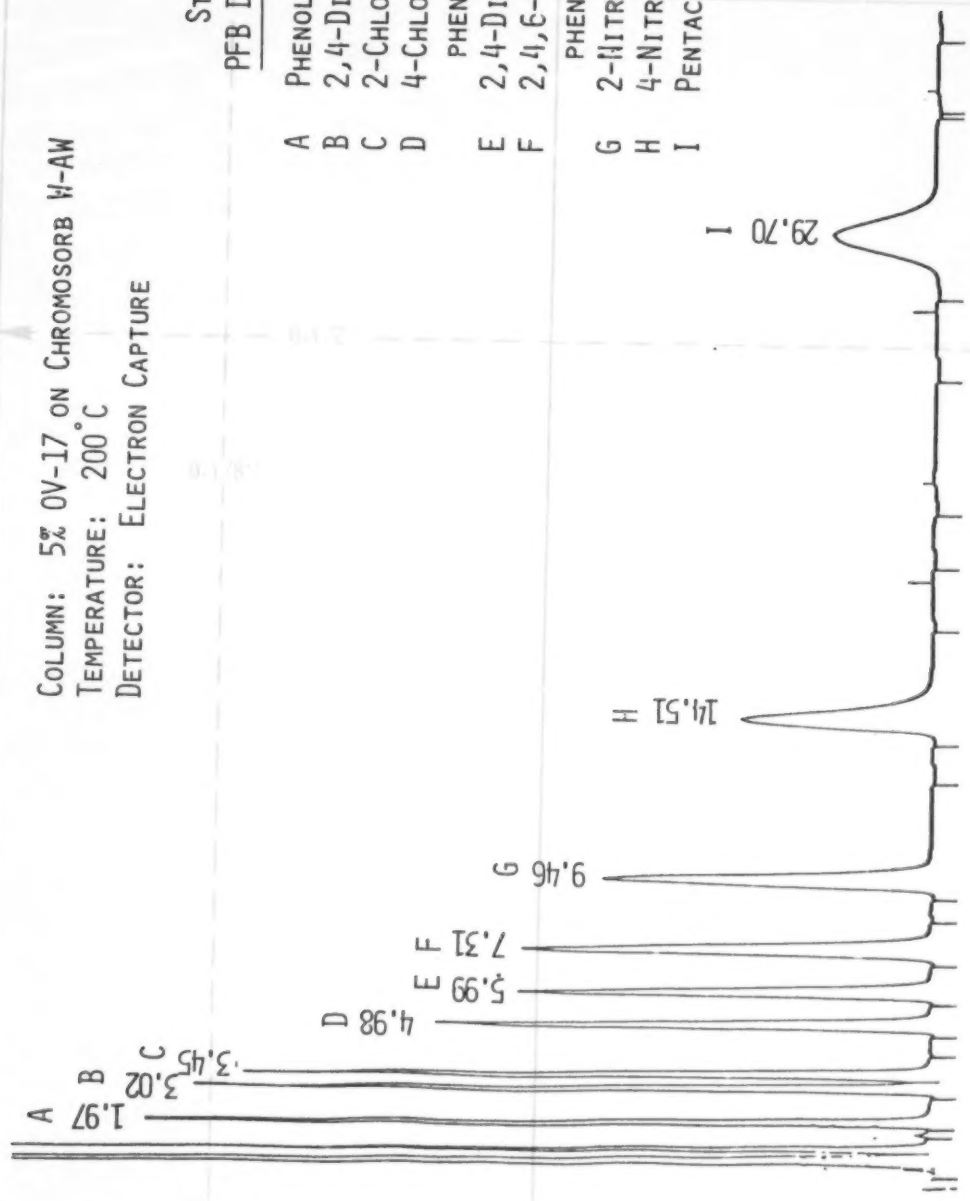


FIGURE 2. GAS CHROMATOGRAM OF PFB DERIVATIVES OF PHENOLS

BEGIN
LAST LINE
OF TEXT

BOTTOM OF
IMAGE AREA
OUTSIDE
DIMENSION
FOR TABLES
AND ILLUSTRATIONS